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ABSTRACT

The first evaluative study is a survey of user -- student and teacher -- response to the School Construction Systems Development (SCSD) schools and to elements of the SCSD building system. Results of the 3,000 person survey are presented both as comparative findings for the 11 SCSD schools involved and as response profiles for each of the schools. Survey data is summarized in graphical form for each school. The second study concerns an attempt to develop a model for an ongoing study of the intricate relationships between the physical environment and educational and behavioral objectives. The purpose of the program studied is to develop a method whereby the science teachers of Oak Grove High School, an SCSD school, may study and improve conditions within their department. Sample survey questionnaires for students and teachers are included at the end of the report. (Photographs may reproduce poorly.) (Author/DN)

ED 067740

Building Systems Information Clearinghouse

Research Report Number Two

EVALUATION

TWO STUDIES OF SCSD SCHOOLS

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INTRODUCTION

The School Construction Systems Development Project (SCSD) was perhaps the most influential experimental program for educational facilities in the past decade. The methods, procedures and hardware systems developed as a result of this project have had a profound influence on the design and construction process.

One of the major criticisms of experimental building programs is directed at their failure to study and evaluate their results in any consistent, objective way. The success or failure of such projects is often based upon criteria which do not provide the kind of data that are useful in improving the original processes. The utility and excellence, if any, of the processes and facilities these programs develop is rarely examined after the buildings have been in use for any appreciable time.

Robert Sommer in his book, *Personal Space*, puts it this way:

> What is needed is a shift in temporal perspective. Just as scientists are thinking more about the future, designers must shift some of their attention away from the past (buildings that have been) and the future (Utopias) and study buildings on the narrow plane of the present and from the standpoint of user behavior. Individual practitioners must abandon the philosophy of "never look back."

In fairness to the design profession, it must be recognized that few boards of education are willing to provide the resources required for such studies.

Educational Facilities Laboratories (EFL), the sponsor of SCSD, recognizing the need for long-term study of the results of its systems programs, authorized its Building Systems Information Clearinghouse to undertake a program of evaluation for all systems projects. This publication reports the results of two studies of the facilities constructed under the SCSD program. Subsequent publications will deal with other systems programs as additional studies are completed.

There are any number of ways to evaluate a school plant. What is reported here are two examples of studies which attempt to relate the facilities to the users—teachers and students.

The first study presents the results of student and faculty opinions on a number of environmental and aesthetic issues. The second presents a model for an ongoing environmental study of the intricate relationships between the physical environment and educational and behavioral objectives. The schools used in these studies were all constructed between 1965-1967 as a part of the SCSD program.

STUDY NUMBER 1
A SURVEY OF USER OPINION

PURPOSE OF THE STUDY

One of the primary objectives of the SCSD Project was the creation of a system which would enable designers to provide the users—students and faculty—with functional, aesthetically pleasant places in which to work. To this end the six subsystems which comprised the SCSD building system were designed to provide the users with optimum environmental conditions in the areas of light, color, sound, and thermal conditions, together with the potential for quick, economical reordering of space configurations in order to respond to changing space requirements.

While it is too early to make definitive judgments about the building system's ability to respond to user demands over any long period of time, there are a number of the user's environmental concerns that can be studied after much shorter periods of occupancy.

One of the essential procedures in the systems approach is that of evaluating results of the course of action selected in order to improve the system. This "feedback" process enables the system to respond to legitimate demands placed upon it in a timely and constructive fashion. The evaluation of the building system on a technical performance basis (that is, comparing the actual performance with that set out in the performance specifications) was carried out prior to the construction of the individual schools. While spot checks of performance have been made in some schools, no large scale technical performance tests have been made in the SCSD schools.

Assuming that technical performance of the building system is at or near the prescribed performance, the question then is one of relevance of this performance to the facility's user.

In the fall of 1969, EFL's Building Systems Information Clearinghouse (BSIC) launched a study of the users' responses to the environments created in the SCSD schools. The purposes of this study were to: 1) determine the extent to which the users were aware of and made use of certain features of the system, and 2) assess the users' reactions to the quality and appropriateness of the environment in which they worked.

STUDY PROCEDURE

In the fall of 1969, BSIC staff with the assistance of several consultants prepared a questionnaire for use with students, teachers, and administrators in the SCSD schools. One version was prepared for teachers and administrators and a simpler, although related, version was developed for use with students.

The instruments were tested on the entire faculty and a sample of the student body at Oak Grove High School, San Jose, California, in the fall of 1969. As a result of this trial run, certain modifications were made to eliminate ambiguous terms and questions that failed to reveal the type of information desired.

The revised version of the faculty questionnaire contained 21 items which could be answered with a "yes," "no," or "don't know" response or rated on a three-point scale of "good," "O.K.," or "poor." Space was provided for comments after each of the scaled items. The final question was open-ended and allowed the respondent free expression on any aspect of the facility.

The student version of the questionnaire consisted of 19 items dealing with various aspects of the school environment and appearance, which were to be rated on the same three-point scale — "good," "O.K.," or "poor." Comments were invited on each item. The final question invited the students to respond to the following statement: "I wish designers of schools would _____." (Samples of these questionnaires may be found in Appendixes.)

Questionnaires were delivered by BSIC staff to each of the ten complete SCSD high schools and the one elementary school. Meetings were held with building principals and/or assistant principals and department heads to explain the study's purpose and to enlist cooperation of the teachers and students.

Procedures for the administration of the questionnaire varied slightly from school to school according to the desire of the building principal. In some schools the materials were simply placed in the teachers' mail boxes along with a letter from the principal explaining the project's purpose. At other schools the materials were distributed and discussed at faculty meetings.

Student questionnaires were administered in a uniform manner in all schools. The school staff selected a class period which they felt would provide a representative cross section of the student population. All students in English classes during that period were asked to complete the questionnaire. Student samples ranged from 6.3 per cent to 21.9 per cent of the total student body, with the ten-school average about 15 per cent. A total of 2,504 students and 535 faculty members from ten SCSD high schools and one elementary school participated in the study.

Student and faculty questionnaires were returned to BSIC for processing by the Stanford University Computation Center. The computer program was written so that responses to each question were given by number and by percentage of total replies on that question. Individual comments were tallied by hand and placed in broad categories where responses were similar in intent.

Results were processed to obtain computer printouts of student and faculty responses by school and as a composite group for all ten SCSD secondary schools. The single elementary school was not included in the composite results for either faculty or students.

PRESENTATION OF THE DATA

Data gathered from faculty and students of the ten high schools may be divided into three broad categories: 1) knowledge of the users about various features of the building system, 2) feelings of the users about quality of the school environment, and 3) their comments about what they considered to be problem areas. In addition, faculty members were gauged on their knowledge of administrative procedures for making use of certain features of the building system. The distribution of participating faculty and students by tenure in the school is shown in Table I.

One of the principal features of the SCSD system was its flexibility. The interior partitions; lighting/ceiling; heating, ventilating, and air-conditioning outlets; and cabinets were all designed to enable the user to make changes as required to meet his specific needs.

TABLE I

DISTRIBUTION OF HIGH SCHOOL STUDENT AND FACULTY RESPONDENTS BY YEARS IN THEIR SCSD SCHOOL

	1 Year		*2 Years*		*3 Years*		*4 Years*		*Total*	
Group	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Faculty	131	25.3	144	27.9	117	22.6	125	24.2	517	100
Students	902	36.0	762	30.4	520	20.8	320	12.8	2,504	100

In order to determine how aware the faculty were of this capability of the system, they were asked whether or not each of these items could be altered or their location changed. The results, shown in Table II, indicate that with the exception of the cabinet interiors, which 67 per cent of the faculty said could be changed, a majority of the staff were not aware that this system had this capability.

TABLE II

FACULTY KNOWLEDGE OF THE FLEXIBILITY OF VARIOUS SCSD SUBSYSTEMS

	Response		
Subsystem	*Can Be Changed*	*Cannot Be Changed*	*Don't Know*
Interior Walls	47%	34%	19%
Accordion Partitions	48	28	25
Operable Panel Partitions	33	28	39
Lighting Fixtures	18	51	31
Ceiling Panels	28	37	35
HVAC Outlets	15	43	42
Interior of Cabinets	67	18	14

The large number of persons who either didn't know or who felt that these subsystems were not amenable to change in location suggests that little information about the building's features had been provided. While varying slightly from school to school, the general pattern of responses indicates a lack of the faculties' understanding of the basic flexibility of their facilities.

The ten high schools are ranked in order by their cost per pupil in Table III, which also indicates the cost per square foot, planned capacity, and number of students and faculty who responded to the questionnaire. The letter designation for each school is used on all comparative charts.

Are There Provisions Whereby Faculty Can Request Changes?

Each of the building principals or assistant principals interviewed indicated that their school had specific procedures whereby staff members could request changes in their facilities. Yet, only half of the teachers and other administrators in the ten schools were aware of the existence of any formal procedures for this purpose. The administrators as a group were only slightly more aware of the procedures than the teacher group. Fifty-seven per cent of the administrative group said their school had a formal procedure, while 35 per cent were unaware of it. The teachers who had been in the school the longest were the most familiar with the procedures (63 per cent) as compared with first year teachers (40 per cent).

There is a wide variation among the ten schools ranging from a high of 84 per cent to a low of 13 per cent of those staff members who knew of the procedures for requesting changes. While the percentage of staff who said that their school did not have a procedure was only 5 per cent, 45 per cent said they did not know of the procedure. The responses for the ten schools are shown in Figure 1.

TABLE III

THE TEN SCSD HIGH SCHOOLS RANKED BY COST PER PUPIL

	Cost		*Planned*	*Response*	
School	*per pupil*	*per sq. ft.*	*Capacity*	*Student*	*Faculty*
A. Fountain Valley High School	$1247	$15.90	3000	611	112
B. Harbor High School	1327	17.16	1200	158	24
C. William Workman High School[sa]	1414	17.62	1300	282	47
D. Glen Wilson High School[sa]	1456	17.72	1500	218	51
E. Casa Robles High School[sa]	1540	18.20	1800	114	67
F. Sonora High School	1586	15.50	2000	241	51
G. Royal High School[sa]	1604	18.45	1800	293	41
H. Oak Grove High School[sa]	1677	19.14	1800	140	37
I. El Dorado High School[sa]	1750	18.43	1000	209	34
J. J. F. Kennedy High School	2204	19.10	2000	238	50
Totals			17400	2504	517

[sa] = school built under California State Aid formula.

Opening dates: 1966: A, F, H, E — in use from three to three and one-half years
1967: C, D, G, I — in use from two to two and one-half years
1968: B — in use from one to one and one-half years

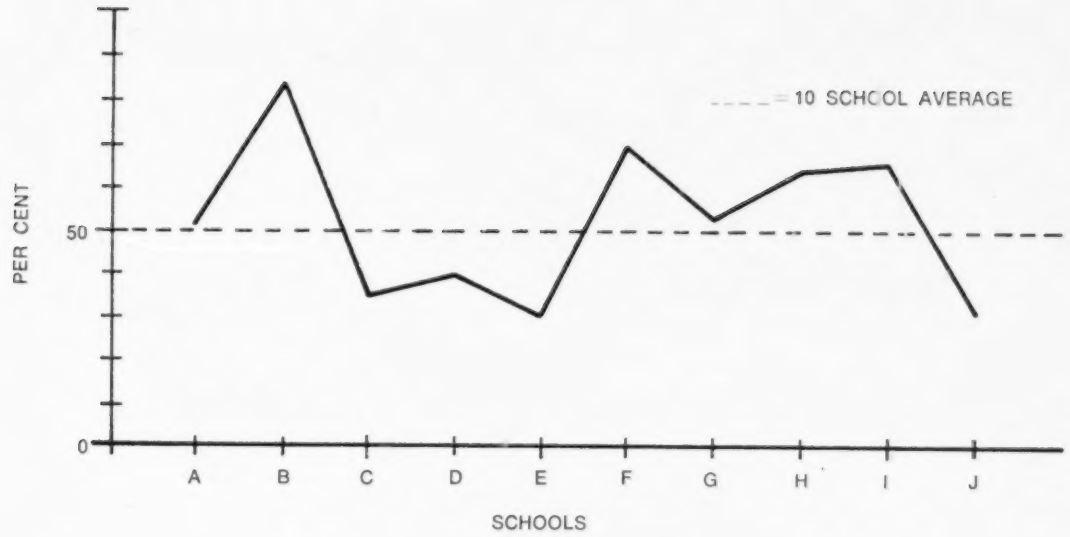


FIGURE 1

Percentage of Faculty Who Were Aware of Formal Procedures for Requesting Alteration to Their Facilities

Have Teachers Been Involved in Changes?

Twenty-three per cent of all teachers in the ten schools indicated they had been involved in some alteration to their teaching space which required physical alteration of the building. The variations among the ten schools can be accounted for generally by looking at the reasons for the changes. The school with the greatest teacher knowledge of change procedures also had the highest percentage of staff involved in making changes. This can be explained by the fact that the facilities as originally constructed proved to be unsatisfactory. The responses for all ten schools are compared in Figure 2.

Are the Teacher Requests Usually Granted?

Approximately 18 per cent of the teachers said they had made change requests that had not been granted. The variation among the ten schools again is quite large with a range from 6 per cent to 48 per cent. The teachers indicated that while the change requests were almost always approved by the building principal, they were turned down for financial reasons at the district level. The greatest number of denied requests were from teachers in areas where special facilities were required, such as music, industrial arts, and home economics.

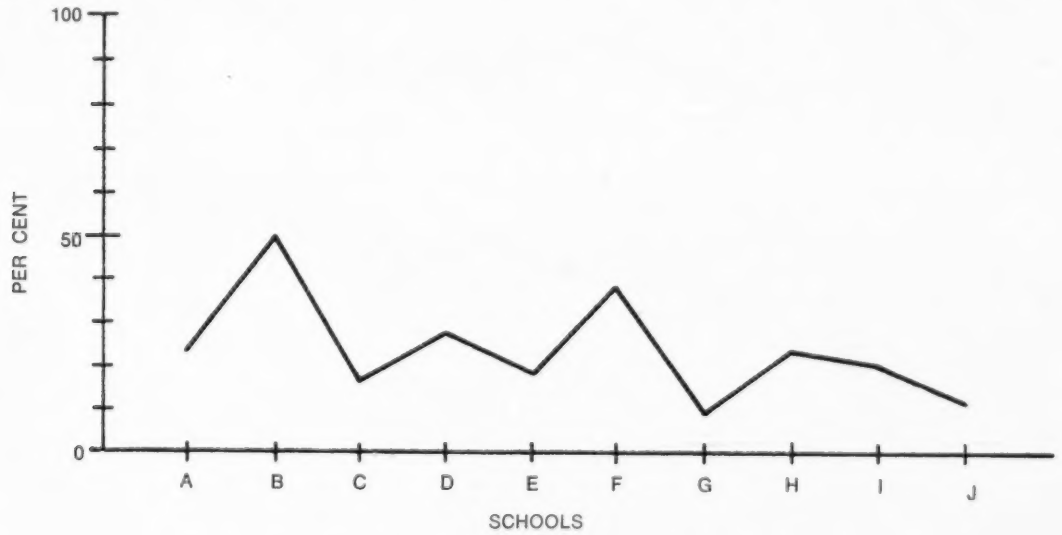


FIGURE 2

Percentage of Faculty Who Have Been Involved in Alterations Requiring Physical Changes to be Made to School Building

Do Teachers Want to Make Changes in Their Environments?

Seventy per cent of the teachers indicated there were changes that could be made to improve their areas. Change requests ranged from additional electrical outlets to complete restructuring of space configurations. Many suggestions involved changes in design.

The longer a teacher had been in the school, the more likely he was to suggest changes. Seventy-six per cent of the fourth year teachers said there were changes that could be made, while only 65 per cent of the first year teachers so indicated.

How Do Students and Teachers Feel about the Environmental Quality of Their School?

A second series of questions was designed to ascertain the feelings of both groups about five environmental factors: appearance; color; sound; lighting; and heating, ventilating, and cooling. Identical questions were asked of both groups. Also, faculty members were asked three additional questions about the lighting, sound, and color conditions in their office spaces. Figures 3 and 4 compare the ten school composite responses of faculty and students. A three-point scale—"good," "O.K.," "poor"—was used in the questionnaire with space provided after each question for the respondent to indicate what he felt the problem was.

Overall Appearance

The overall appearance of the schools was rated "good" by 73 per cent of the faculty, while the students were considerably more restrained in their enthusiasm, with only 36 per cent rating the appearance "good" and 49 per cent as "O.K." While only 4 per cent of the faculty said the appearance was "poor," 15 per cent of the students so indicated.

Both groups were slightly more critical of the outside appearance of the schools, with 8 per cent of the faculty and 23 per cent of the students ranking it as "poor." The majority of the comments made by students related to the lack of landscaping.

As might be expected, there was considerable variation among schools on this question. While the overall trend of the faculty's response was similar, the students were generally more critical. Three of the schools received a "good" rating by over 90 per cent of their faculty and were not rated "poor" by a single faculty member. A comparison of the student and faculty responses on each of the ten schools is shown in Figures 5 and 6.

Interior Appearance

The interior appearance of the schools was generally rated higher than the outside appearance by the students, while faculty opinion remained about the same for each. The appearance of ceilings and interior partitions, both SCSD components, received slightly lower ratings than the general interior appearance. Partitions were downgraded primarily on the basis of lack of color rather than their performance. This lack of color was cited by the majority of students who commented on this question. There is a marked difference between responses of students and faculty with respect to their rating of partitions and the corresponding question on the use of color. Only 29 per cent of the students rated the partition appearance as "good" compared with 46 per cent of the faculty. On the question of the use of color, the students were more inclined to be critical of color selection, characterizing it as "dull," "drab," or "uninteresting." Twenty per cent of the students rated color use "poor" contrasted with 10 per cent of the teachers.

Acoustics

One of the most critical areas as far as the responses of both faculty and students were concerned was the matter of acoustics. The staff was asked to rate three areas of the school: their instructional area, their office area, and the corridors. Students were asked about sound conditions in corridors and instructional areas. Both groups were asked about noise isolation between rooms.

The schools studied differed widely in the way in which spaces were separated in the instructional areas. This was also true between departments in the same school. Some departments, generally the humanities, were more open than were such specialized areas as science and math. Those schools with the most traditional configurations, i.e., closed, seemed to be the most satisfactory acoustically from the point of view of both students and teachers. Forty-five per cent of the teachers and 49 per cent of the students rated noise isolation between rooms as "poor." As a group, the humanities, art, and music teachers were the most critical, with 50 per cent of these teachers rating the noise isolation as "poor." The most satisfied were the math and science teachers where 63 per cent rated noise isolation "good" or "O.K." The length of time that a teacher had been in the school did not appear to have any bearing on the rating given.

The students were more aware of the noise isolation problem than were their teachers. Almost half of the students rated noise isolation between spaces as "poor." They were not, however, as critical about sound conditions within instructional spaces as were their teachers. Thirty-seven per cent of the teachers rated sound conditions in their instructional spaces as "poor" as compared with only 29 per cent of the students.

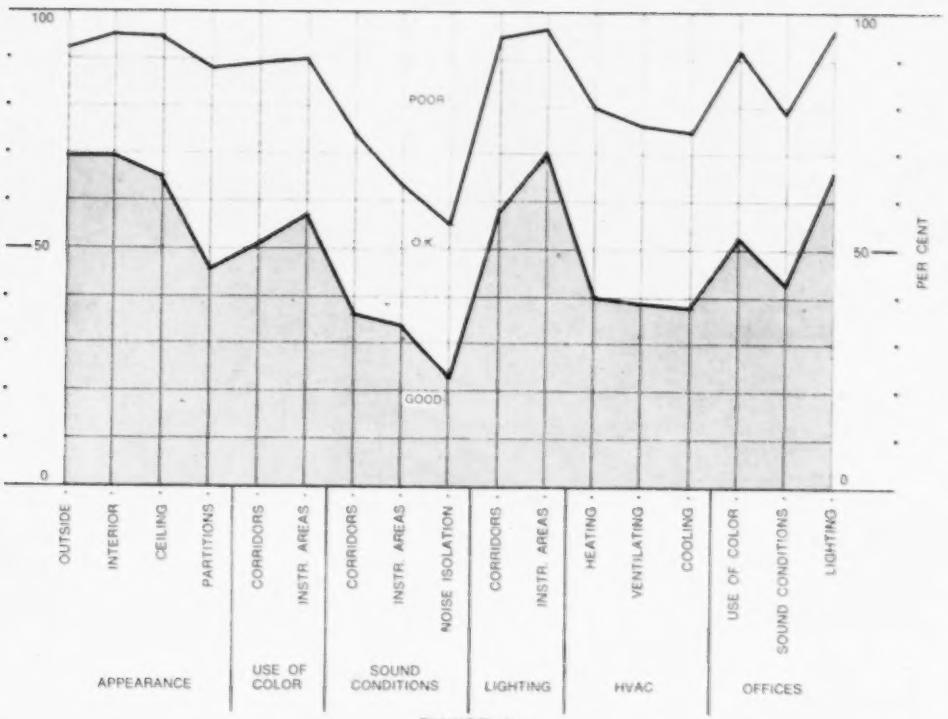


FIGURE 3
Quality of the School Environment
As Seen by the Faculties of Ten SCSD High Schools
N = 517

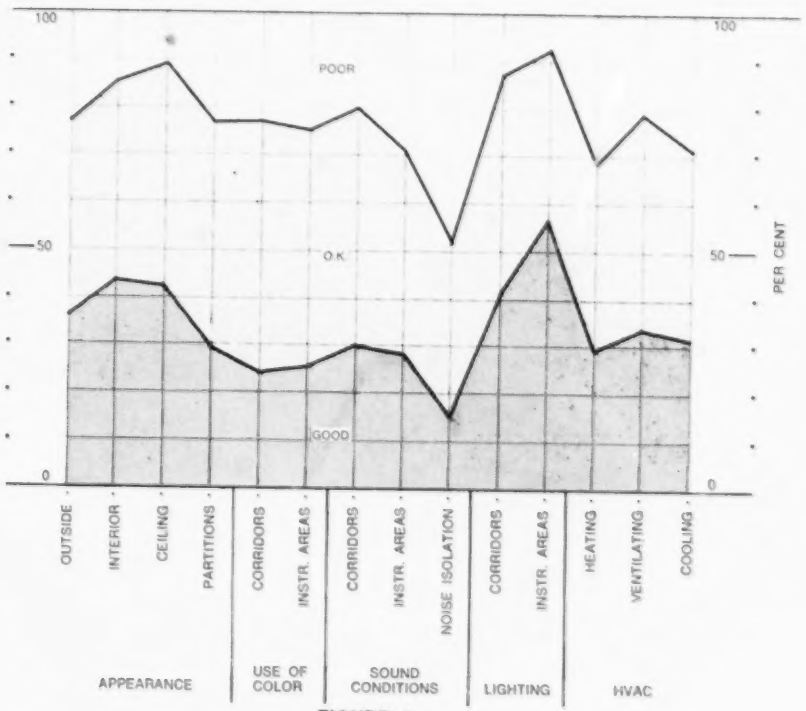


FIGURE 4
Quality of the School Environment
As Seen by the Students of Ten SCSD High Schools
N = 2504

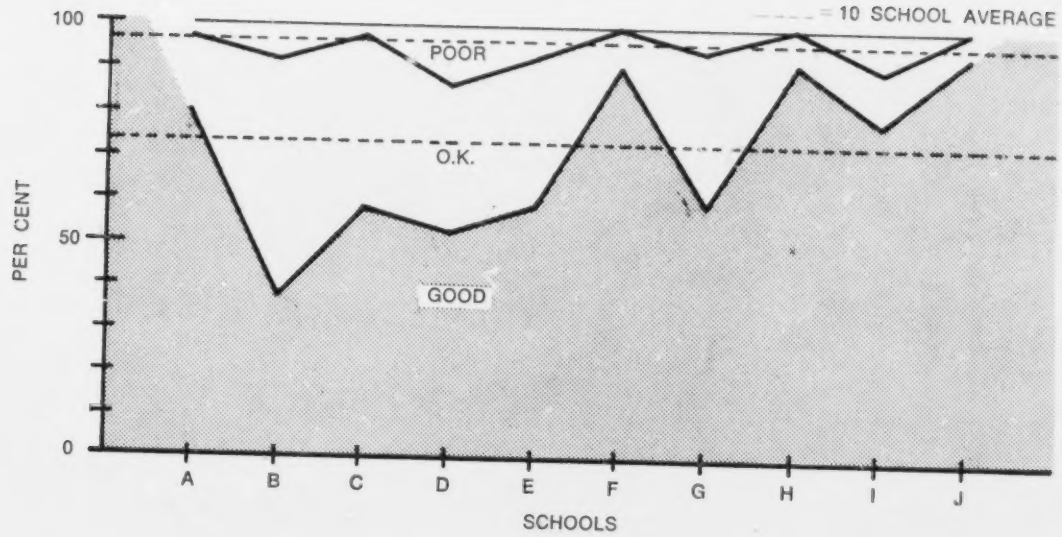


FIGURE 5

Overall Appearance of Ten SCSD Schools As Seen by Their Faculties

N = 517

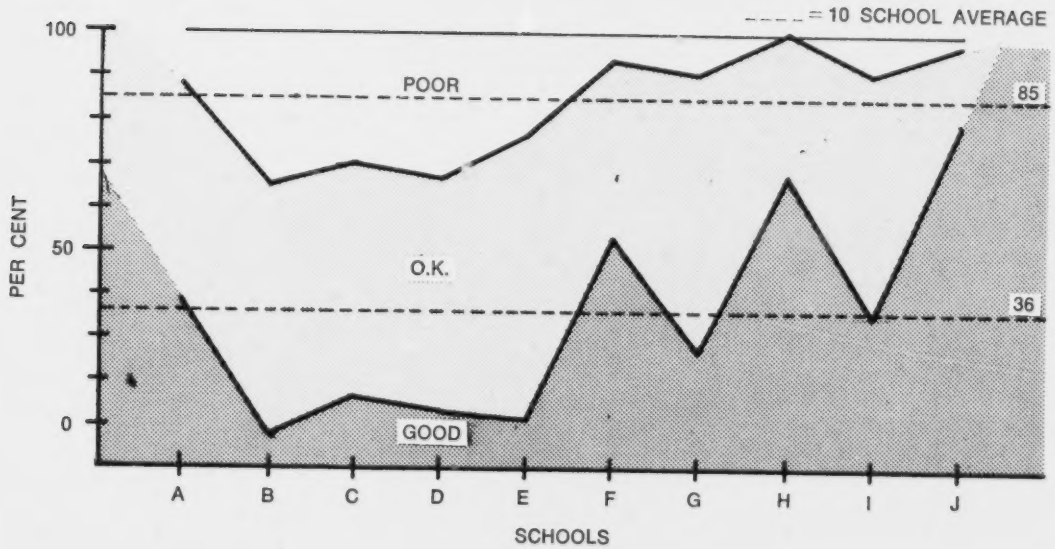


FIGURE 6

Overall Appearance of Ten SCSD Schools As Seen by their Students

N = 2504

There was considerable variation among the ten schools in response to the question of sound conditions within instructional space. In general those schools with classrooms of the most traditional design, i.e., most closed, were rated the most satisfactory by both students and teachers. A comparison of the responses of students and teachers for each of the ten schools is shown in Figures 7 and 8.

Lighting and Ceiling

Lighting received generally high ratings by both students and faculty. On the question of artificial lighting in instructional spaces, 94 per cent of the faculty and 93 per cent of the students rated the lighting "good" or "O.K." Ceiling appearance was also judged "good" or "O.K." by 94 per cent of the staff and 89 per cent of the students.

Heating, Ventilating, and Cooling

The HVAC system was rated "good" or "O.K." by 76 per cent of the faculty and 72 per cent of the students. Primary complaints by both students and faculty related to problems of control of the heating and cooling. Some problems could be traced to thermostats, which could be tampered with by students, while other problems related to difficulties (since corrected) with the start up of the burners in the morning.

Temperature regulation by means of room thermostats was done daily or more often by 11 per cent of the teachers and sometimes by 40 per cent. Twenty-four per cent said that change was not permitted.

Cabinetry

A design feature of the SCSD cabinets was the provision for rearranging the cabinets' interiors. More teachers were aware of this feature than any other aspect of flexibility in the SCSD system. Sixty-seven per cent of the teachers said the cabinets could be changed. The nearest component in terms of teacher response was in the accordion partition category where 48 per cent were aware of its flexibility. Eighty-four per cent of the faculty thought the cabinets were "good" or "O.K." Colors and finish of the cabinets rated even higher with 97 per cent of the faculty stating the colors were "good" or "O.K.," and 99 per cent similarly rating the finishes.

Lockers

The SCSD lockers were book lockers either 15" × 15" or 15" × 20" in size. The students rated these lockers as "poor" (43 per cent) primarily on the basis of their lack of storage room for coats and other wearing apparel. While the number of comments written in response to most questions was rather small, the comments on locker size exceeded comments on all other questions. In one school 50 per cent of the students sampled expressed an unfavorable opinion on the locker size.

SUMMARY AND CONCLUSIONS

The methodology employed in this study relies upon the user's perceptions of his environment. Each person, therefore, sets his own standards against which to measure performance. His rating is influenced by his past experience which in turn affects his expectation. There is at present no comparable study of high schools that can be used as a standard of comparison. Until such studies are available, the performance judgment of the users—students and teachers—must be used as the basis for assessing each school's performance.

It is quite obvious that the users are not satisfied with the acoustical performance of their schools. From observations made at the various schools, a variety of reasons for the acoustical problems may be postulated. In some cases, the schools are not being used in the way the designers anticipated. Large open spaces, which were designed for team teaching, are being used as self-contained classrooms with disastrous results acoustically. In some cases, where openings without doors are used, the openings are placed opposite one another across traffic ways, which allows sound to travel in an unrestricted path from one space to another.

The acoustical criteria suggested by SCSD were generally ignored by the designers. The system offered acoustical wall treatment as a part of the partition subsystem. Not one architect used this method to control acoustics. One of the problems that many designers failed to consider was that both walls and ceiling were metal. The ceiling subsystem had as one of its options a perforated metal acoustical pan at a slightly higher cost. If more of these had been used, the acoustical performance would have been improved. Too much reliance was placed on carpeted floors to absorb the sound and too little on providing sound absorption in walls and ceilings.

The sound separation between spaces was partly a matter of the rather low sound absorbing qualities of the ceiling coupled with the fact that the space above the ceiling was open so as to serve as a return air plenum. While the system was supposed to provide a method of baffling above the ceiling where required, very few architects considered this necessary.

The unfavorable comments about acoustics in the SCSD schools are a result of a combination of all of these factors: teaching styles not properly matched to their spaces, lack of proper acoustical treatment of certain parts of the spaces, and a plenum space which

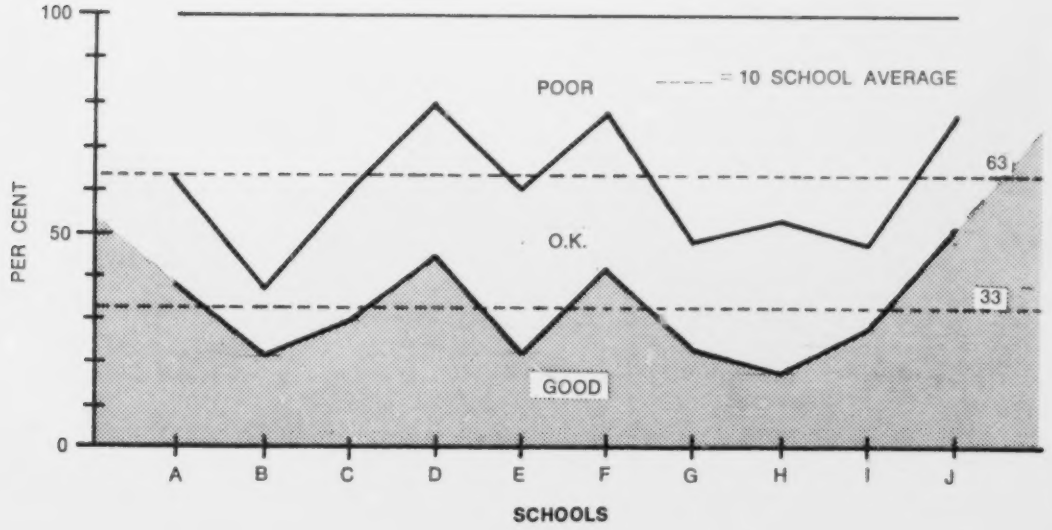


FIGURE 7

Sound Conditions in Instructional Spaces
As Seen by the Faculty of Ten SCSD High Schools

N = 517

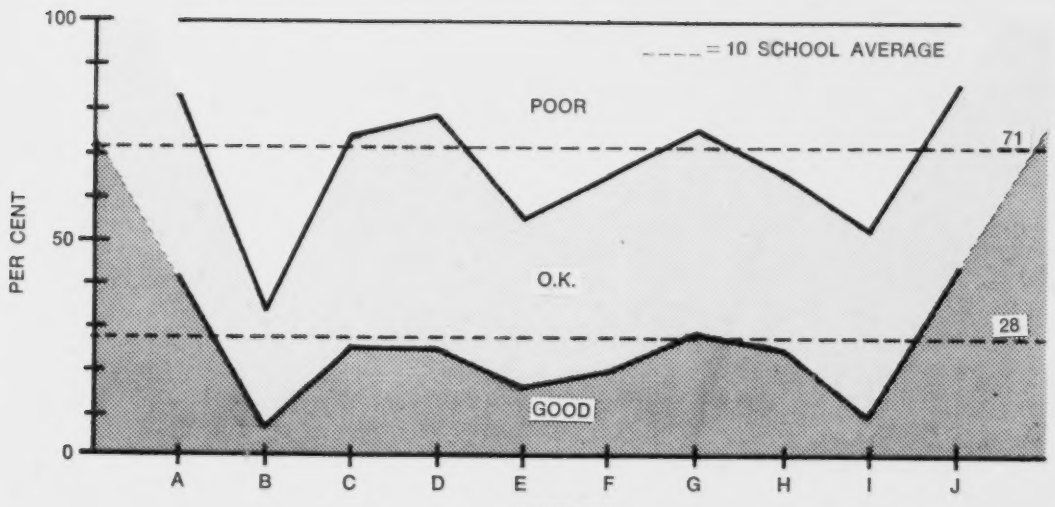


FIGURE 8

Sound Conditions in Instructional Spaces
As Seen by the Students of Ten SCSD High Schools

N = 2504

was combined with a ceiling which lacked the necessary acoustical absorption to prevent sound transfer.

The only other area which failed to achieve 80 per cent or more "good" or "O.K." responses was in the heating, ventilating, and cooling area. Most complaints in this area had to do with temperature regulation. Very few unfavorable comments were made about the ventilation part of the system. Many of the problems could be traced back to start-up problems in a few units. It often took some time to get the entire system functioning properly, which may account for some complaints. Some problems were caused by improper maintenance, which appears to be a problem for those districts which did not avail themselves of the maintenance contract offered as an option to the districts.

One of the principal student complaints about the appearance of their schools was the lack of color. The SCSD partition system offered 33 colors for the architects' selection. While many architects used a coordinate range of basic colors and bright accent colors, others did not. If the students had their way, greater use of the brighter color group would have been made.

With the exception of acoustics, the general performance level of the SCSD system appears to have been satisfactory. While some schools have taken advantage of the flexibility built into the system, a lack of knowledge on the part of most teachers about the flexibility and the procedures for initiating changes has prevented greater use of the system's potential.

While 70 per cent of the teachers indicated that there were changes they would like to make, a majority were not aware of the procedures available to them for making these changes. Some type of instructional manual detailing the procedures for requesting changes and acquainting students, teachers, and administrators with the various features of their school plant would serve to alleviate some of the problems in this area. While it is too early to assess the system's performance with respect to change and its ability to meet the demands for change on the part of the user, it is apparent that the flexibility useful to the user must be of a type that can be manipulated by him or by someone attached to a staff of the individual school.

The following section of the report presents a profile of each of the ten high schools and the single elementary school. Pertinent comments made by faculty and students with respect to these schools are also presented.

FOUNTAIN VALLEY HIGH SCHOOL

Huntington Beach Union High School District
Huntington Beach, California

Architect:	Neptune and Thomas
Area:	235,418 square feet
Capacity:	3,000 students
Construction Begun:	August 1965
School Opened:	September 1966
Building Cost:	$3,741,830
per square foot:	$15.90
per pupil place:	$1247

STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . make bigger doors in the halls. When the bell rings everybody heads for the doors, the squish! It always happens. Maybe if they got rid of the bar in between the door, it might help.

. . . have made the school with much more greenery and landscaping in mind. They also could have made conditions more "homey" instead of so cold and sterile by having paintings, mosaics, sculpture installed in various areas around campus and in the halls. Additional room for eating lunch should have been considered. The auditorium should have better acoustics.

. . . make better use of nature. Classes should, as *much* as possible, and as *often* as possible, be held *outside*, especially since we in Southern California enjoy such a beautiful climate. Outside classes would call for lots of grass and trees and flowers—good landscaping in general. The school buildings should be used only for storage and for use during inclement weather.

. . . make schools more colorful. However, this school on the whole is very comfortable. I think that windows should always be put in a school. Carpets are good. Library is good at this school. P.E. facilities should be as good as they are here, in every school.

. . . keep in mind that school is where teachers and students spend most of their day, and, therefore, a comfortable, pleasant atmosphere is desirable. A lot of color, and a much livelier room would be appreciated.

. . . design individual study centers — not like a library, but a place where students can be alone or go to talk with someone.

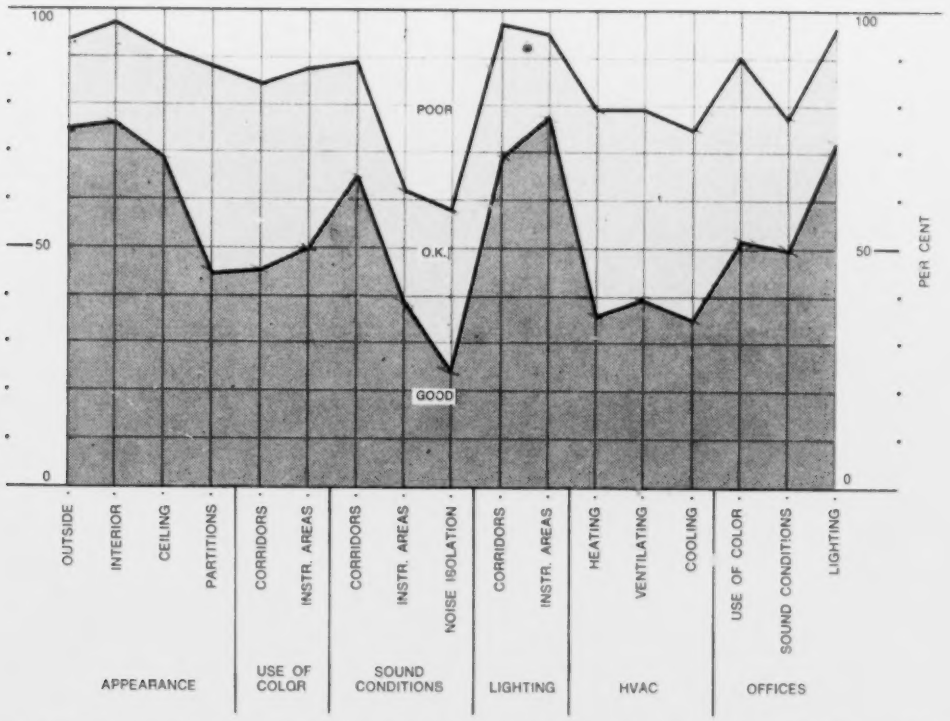
. . . put the high school more out in the front instead of being surrounded by a parking lot. Have more grass and less concrete.

. . . make bigger lockers and not so many of them on top of each other. It is very bad to have a bottom locker, and have three or four students stepping on you!

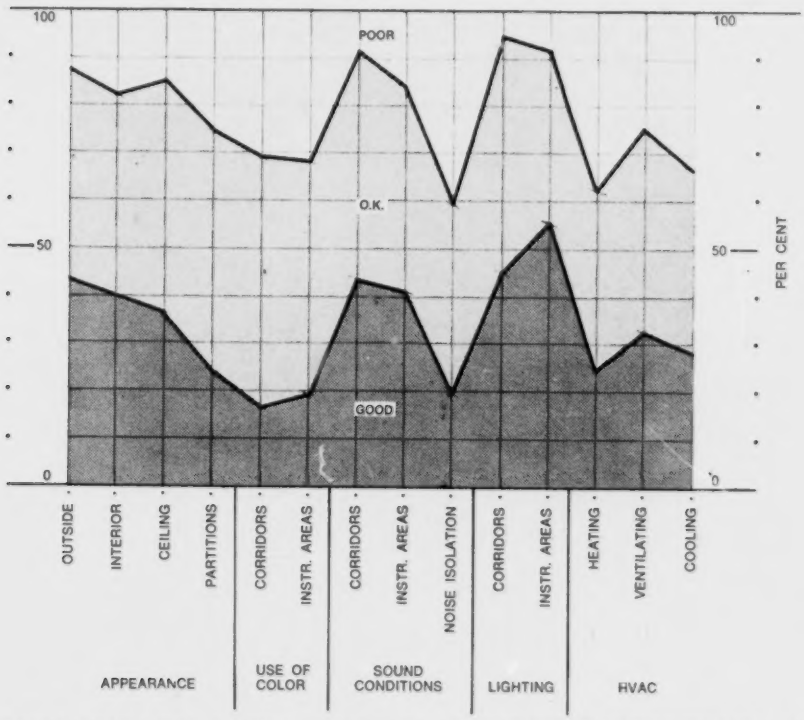
. . . keep carpeting schools, it's great. Enclose more of the school, it is horrible on rainy days.

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	51%	2%	47%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	24%	76%	—
In this school, have you ever requested alterations of spaces which were not approved?	11%	89%	—
Are there alterations which could be made to improve your area?	66%	34%	—



FOUNTAIN VALLEY HIGH SCHOOL FACULTY RESPONSE (N = 112)



FOUNTAIN VALLEY HIGH SCHOOL STUDENT RESPONSE (N = 611)

HARBOR HIGH SCHOOL

Santa Cruz City High School District
Santa Cruz, California

Architect:	Porter, Jensen, and Associates
Area:	92,773 square feet
Capacity:	1,200 students
Construction Begun:	March 1967
School Opened:	September 1968
Building Cost:	$1,592,320
per square foot:	$17.16
per pupil place:	$1327

STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

This student questionnaire was administered during the rainy season, which may account for the large number of comments on the problem of protection from the rain.

. . . put themselves in our places and realize that we don't want to look like drowned rats going between classes in the rain.

. . . design a school that they would enjoy going to themselves with covers for rain, quieter rooms, fewer stairs (should have built school on a flat surface!) and brighter colors to cheer you up *NOT* depress *YOU*! I hope I didn't write this so it could be filed away.

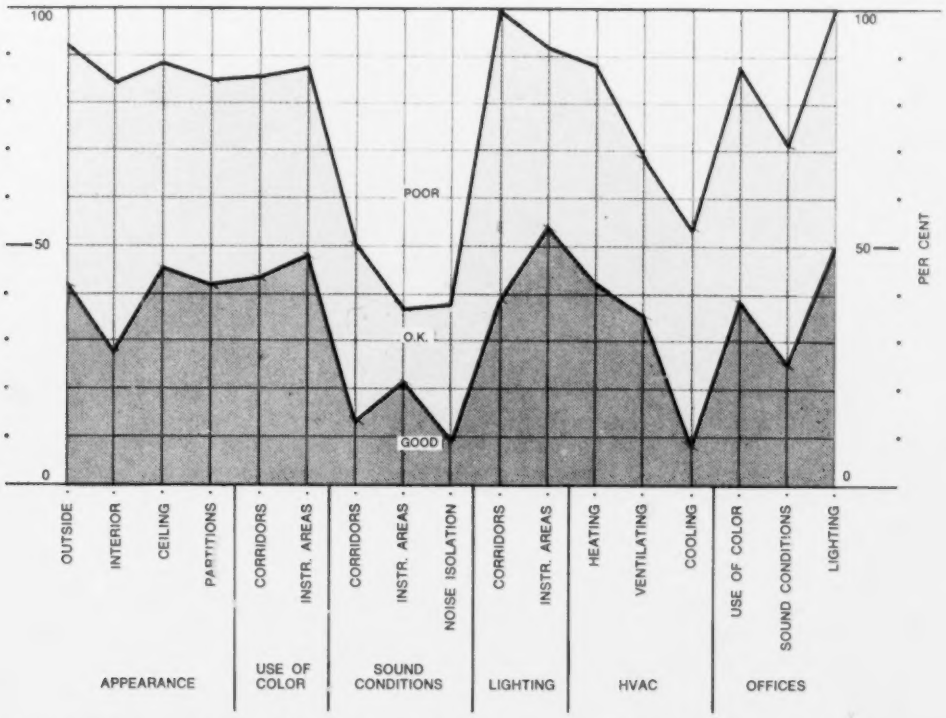
. . . consider the elements. There is *no* protection during rain, especially wind and rain over most all of the campus. Also, something should be done to change the angle of the stairway and the width of the stairs. The stairs at this school are my perpetual fear, and I feel that changing them is more important to the safety of students and faculty than the appearance of the ceiling. We need a cafeteria or a drastic change of food in the machines. Provisions for drainage might have been considered but there seems to be no evidence of it at the moment. Personally, I like the new music room at Santa Cruz High more than the box-buildings that have been built for us here. Parking lot space should be provided above and below for student use.

. . . have outside landscaping, more attractive and more useful to students, faculty, etc., and make the school look better forever.

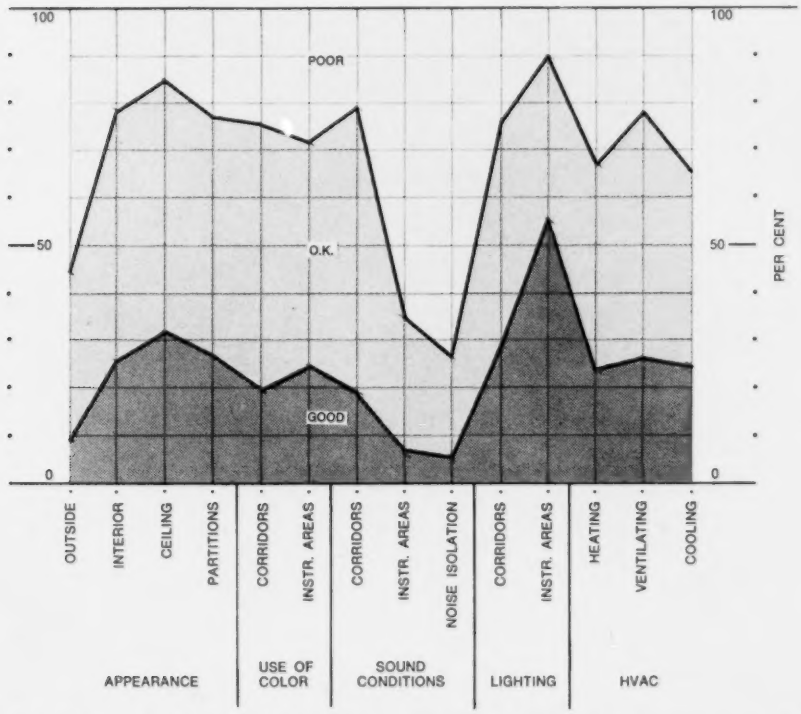
My foremost gripe is with the teaching method—not the buildings. However, I think building designers must know what inspires the mind. An infant is excited over motion and color — bright color. This activates the mind. Super neutral colors—especially green and goldish tones—relax the mind, have a calming effect. That is why mental institutions are neutral greens. Why are schools neutral greens and golds? To stop the mind from working? To drain thought? There should be bright colors.

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	84%	0%	16%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	50%	50%	—
In this school, have you ever requested alterations of spaces which were not approved?	40%	60%	—
Are there alterations which could be made to improve your area?	81%	19%	—



HARBOR HIGH SCHOOL FACULTY RESPONSE (N = 24)



HARBOR HIGH SCHOOL STUDENT RESPONSE (N = 158)

WILLIAM WORKMAN HIGH SCHOOL

La Puente Union High School District
La Puente, California

Architect:	Kistner, Wright, and Wright
Area:	104,350 square feet
Capacity:	1,300 students
Construction Begun:	September 1966
School Opened:	September 1967
Building Cost:	$1,838,374
per square foot:	$17.62
per pupil place:	$1414

STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . take a good look at it from Amar Road. I'm sure they would see that it looks like a prison on the hill. The school needs grass and trees and more color. If we had proper grass and coloring, we would have the best looking school around. That would help a lot with school spirit. Also, the constructors should get the work done and clean up their mess so we don't have to look at it during school. We want *beauty* in our school. So how about it?!!!

. . . finish it pronto, so we could have a finished school, not always half done. We could get grass, trees and so forth.

. . . start using different colors other than blue, green, beige or white. Whatever happened to red and orange?

. . . make some place for us to eat, especially when it rains. It's a good looking school, but it's built for someplace where it doesn't rain and it does rain. It's pretty bad when we have to eat in the pouring rain. We should have a cafeteria or something. The stairs are very dangerous, especially the ones in the Greek theatre. They are very nice looking but not very practical.

. . . make the school more interesting. All the schools around here are practically identical! Workman should have something on the outside of all buildings so everyone knows that this school is Workman High School.

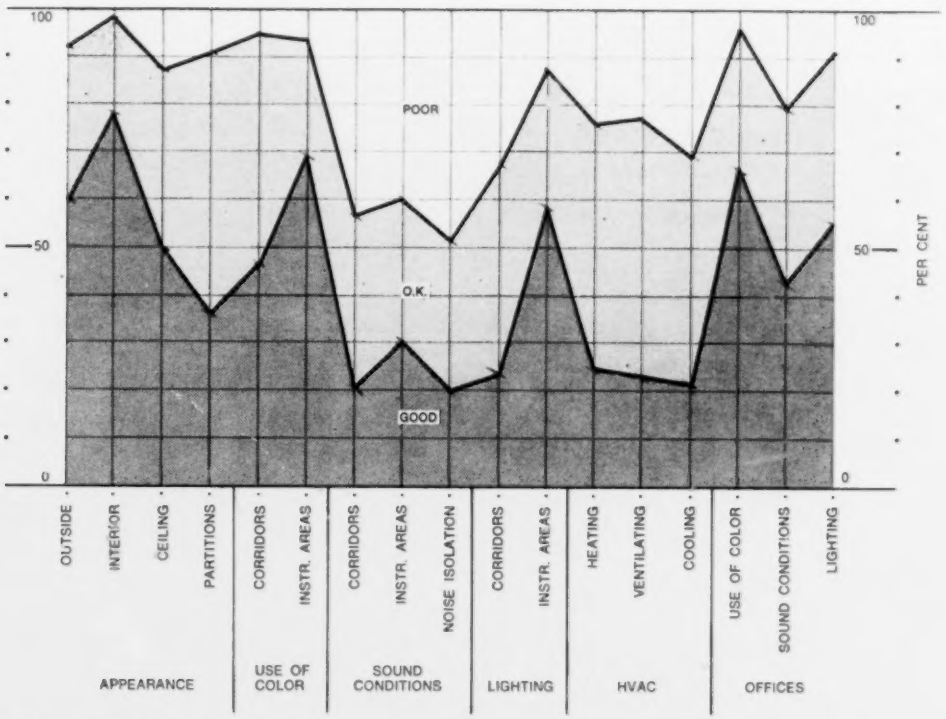
. . . take into account the distance that students must cover between some classes and the supplies sometimes necessary for class. Our lockers are entirely too *small*! Especially in the rainy season, umbrellas won't fit inside the lockers.

. . . put windows in the rooms. I feel like I'm in a prison because I can't see the outside. I realize that without windows the designers expect students to pay more attention to the instructors, but in my case, and in many others, I find myself becoming bored very fast and often I feel like going to sleep.

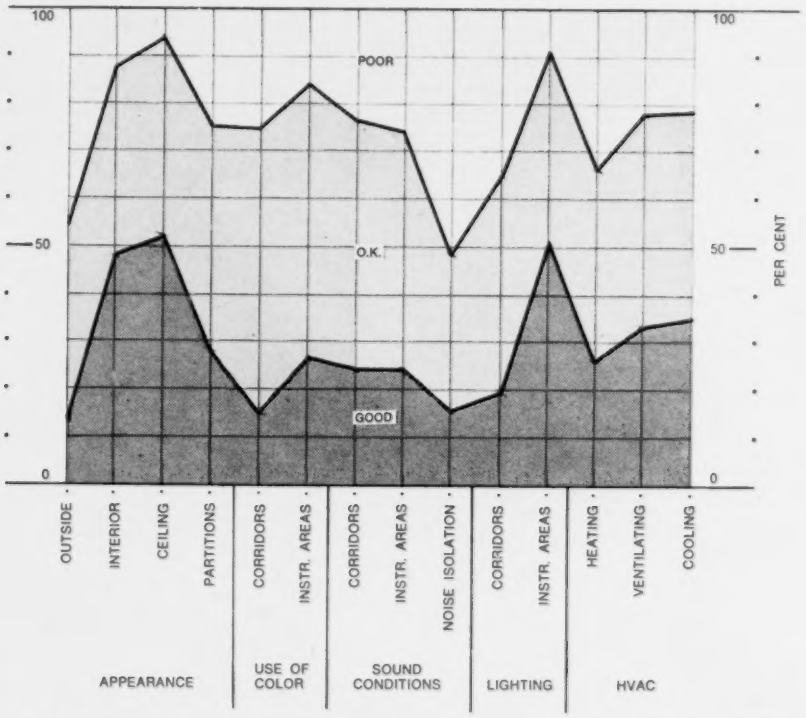
. . . work it so that construction would be going on on only one campus at a time so that the construction workers would get through earlier so that landscaping could be finished. Also, they should take into consideration how many showers are taken in the locker room each day so that they would plan for larger water heaters.

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	35%	5%	60%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	17%	83%	—
In this school, have you ever requested alterations of spaces which were not approved?	10%	90%	—
Are there alterations which could be made to improve your area?	71%	29%	—



WILLIAM WORKMAN HIGH SCHOOL FACULTY RESPONSE (N = 47)



WILLIAM WORKMAN HIGH SCHOOL STUDENT RESPONSE (N = 282)

GLEN WILSON HIGH SCHOOL

La Puente Union High School District
La Puente, California

Architect:	Kistner, Wright, and Wright
Area:	123,238 square feet
Capacity:	1,500 students
Construction Begun:	September 1966
School Opened:	September 1967
Building Cost:	$2,184,326
per square foot:	$17.72
per pupil place:	$1456

STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . give us a bigger lunch area. We need somewhere to sit besides the one little group of tables. There should be a nice area with grass and plants for the kids to go with benches scattered around. The main things needed are *TREES, PLANTS, BENCHES, GRASS.*

. . . make schools to be something that the students will be proud of. I don't like schools that are copied like the schools in La Puente area.

. . . plant some trees or plants to put around the buildings. We think that the students should get a say in what they want and if they can help do it. I think that we should be able to help decorate the different rooms.

How about some green things, i.e. trees, grass, flowers, moss, even weeds, (paint).

. . . put a little more color in the school. And *would put windows in the school*!! Maybe something like a fountain for decoration. And a school has to have a lot of plants to look good! Also, every school should look different from the outside.

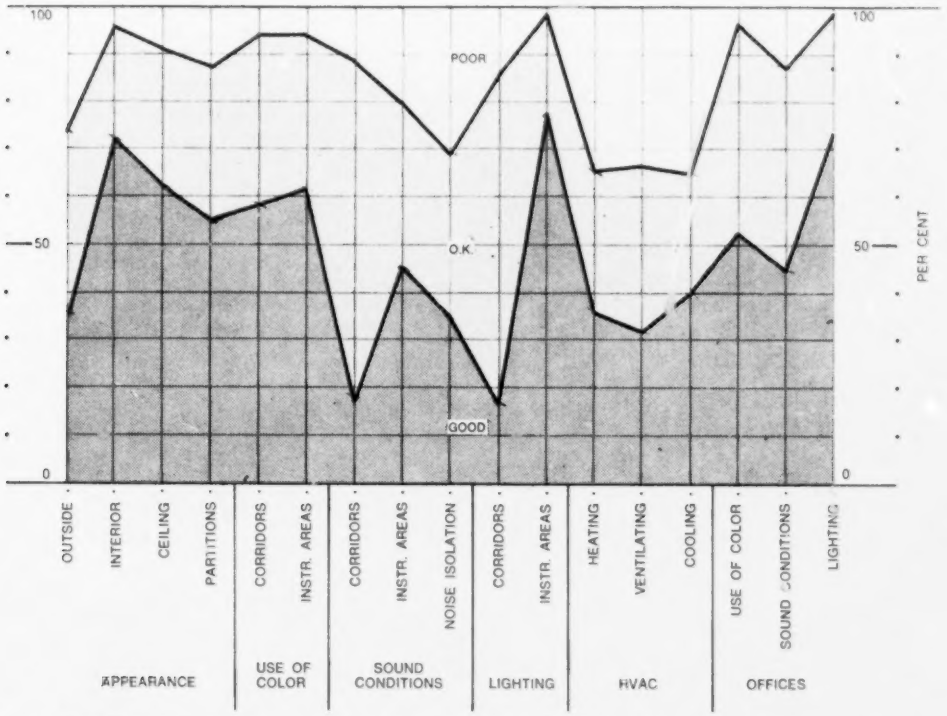
. . . put more windows into the rooms. I feel like I'm in an isolation chamber, cut off from the real world. It's too artificial.

Here's something you might not have thought of. Bands march. There should be a clear wide path between the bandroom and a suitable place to march like the parking lot, but the marching area should have a constant width.

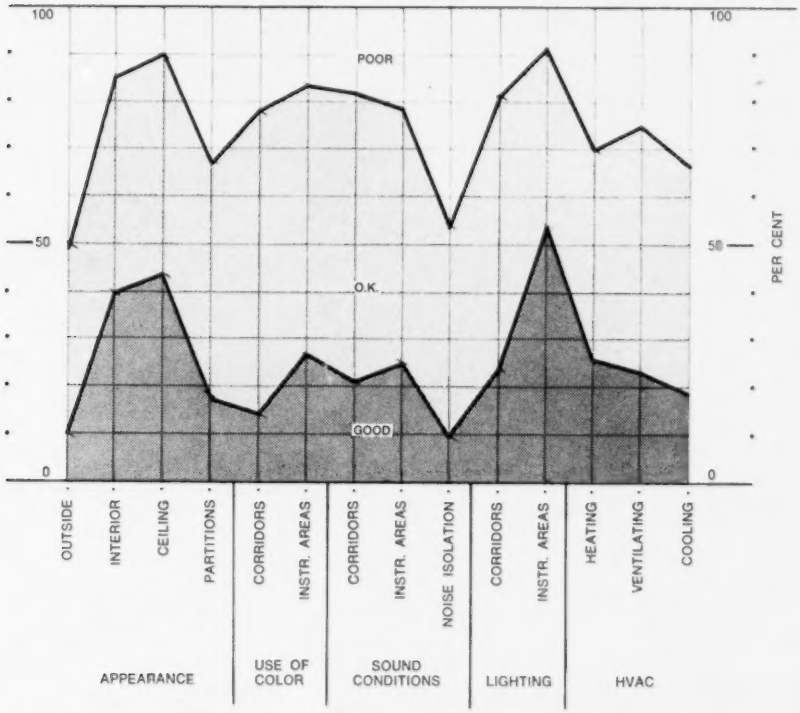
. . . build a football stadium with electrical scoreboard.

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	40%	4%	56%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	28%	72%	—
In this school, have you ever requested alterations of spaces which were not approved?	11%	89%	—
Are there alterations which could be made to improve your area?	60%	40%	—



GLEN WILSON HIGH SCHOOL FACULTY RESPONSE (N = 51)

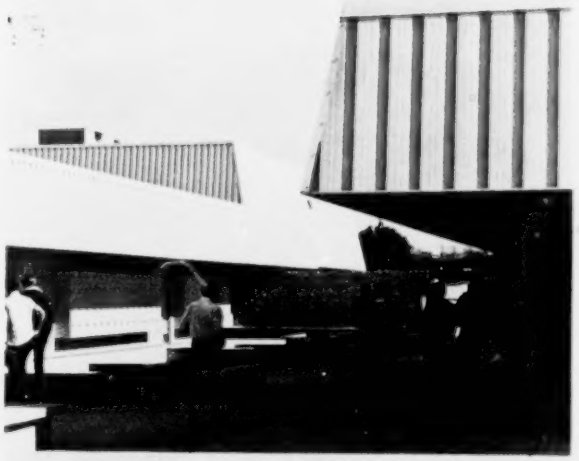


GLEN WILSON HIGH SCHOOL STUDENT RESPONSE (N = 218)

CASA ROBLES HIGH SCHOOL

San Juan Unified School District
Carmichael, California

Architect:	Nicholas A. Tomich
Area:	152,256 square feet
Capacity:	1,800 students
Construction Begun:	Phase I—November 1965
	Phase II—February 1967
School Opened:	Phase I—October 1966
	Phase II—September 1967
Building Cost:	$2,770,970
per square foot:	$18.20
per pupil place:	$1540



STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . put sheltered walkways here so we girls won't get the frizzies.

. . . try to put a little more color and life into schools, make things brighter, a nicer place to be.

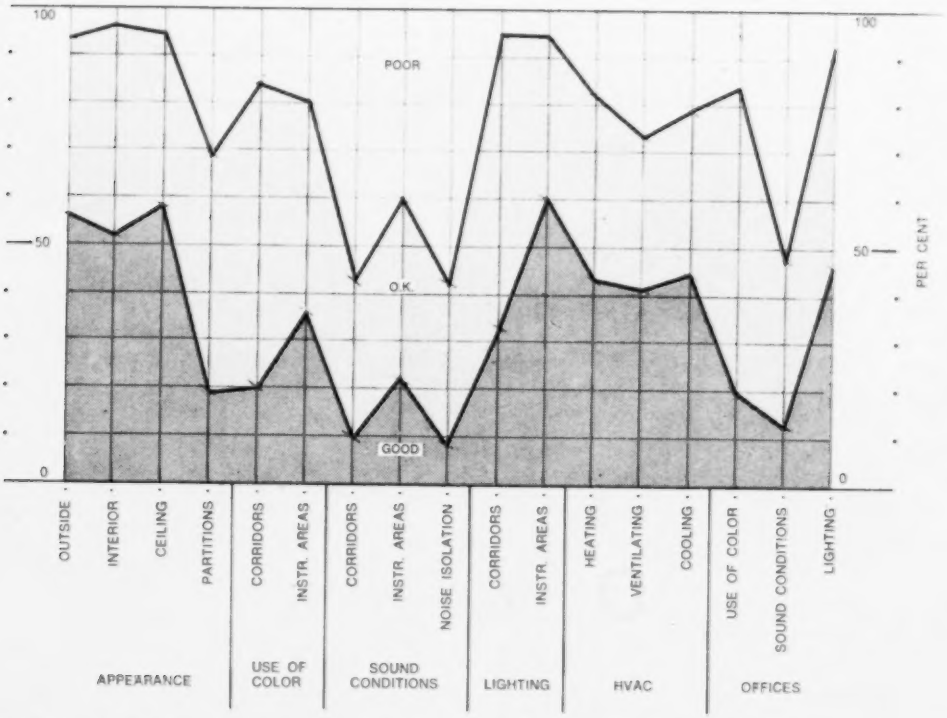
. . . make schools more colorful with lots of GREENERY and lawns. Not just dirt.

Why make fold-up walls if you never fold them up! This only makes sounds travel to other rooms faster. You can hear at least one other class in session.

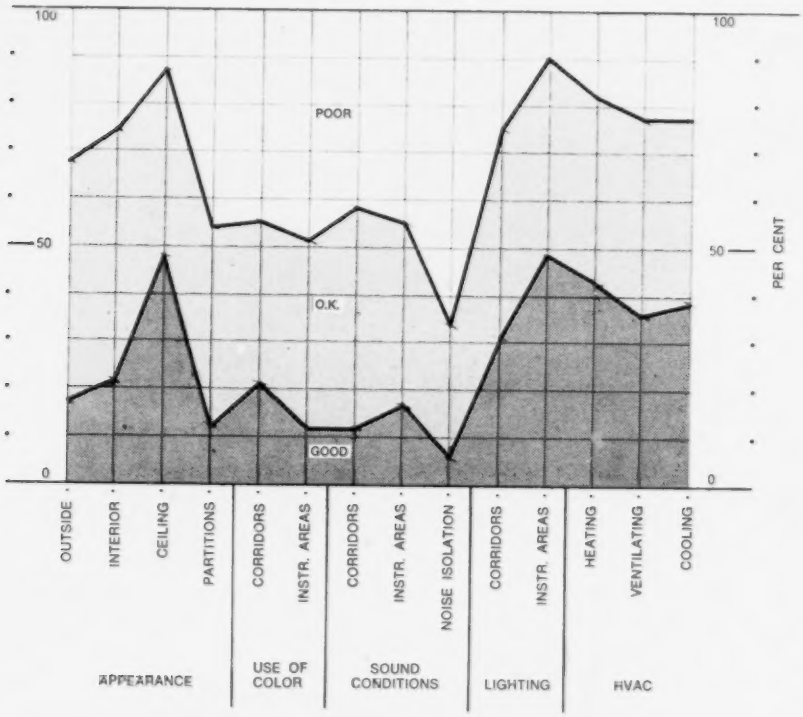
There must have been a sale on cement because we sure got enough of it around here. Maybe we don't have to walk in mud, but the rest of our body gets wet because there are no hall coverings.

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	31%	12%	57%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	19%	81%	—
In this school, have you ever requested alterations of spaces which were not approved?	19%	81%	—
Are there alterations which could be made to improve your area?	79%	21%	—



CASA ROBLES HIGH SCHOOL FACULTY RESPONSE (N = 67)



CASA ROBLES HIGH SCHOOL STUDENT RESPONSE (N = 114)

SONORA HIGH SCHOOL

Fullerton Union High School District
Fullerton, California

Architect:	William E. Blurock and Associates
Area:	204,644 square feet
Capacity:	2,000 students
Construction Begun:	October 1965
School Opened:	1st section—September 1966 2nd section—December 1966
Building Cost:	$3,172,320
per square foot:	$15.50
per pupil place:	$1586

STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . not build schools like this. You never get to see the sky except during P.E. You feel like you're in a prison or a cage.

. . . build more schools like Sonora!

. . . make lockers bigger and not so low.

. . . put more color to work in painting and in planting. The walls are all the same color, dull off-white. The plants are all that dull green.

We need windows so you can get lots of sunshine and so you can see the outside world to see what daytime looks like.

. . . use more colorful imagination.

. . . make areas outside with trees and benches so we could enjoy the outdoors.

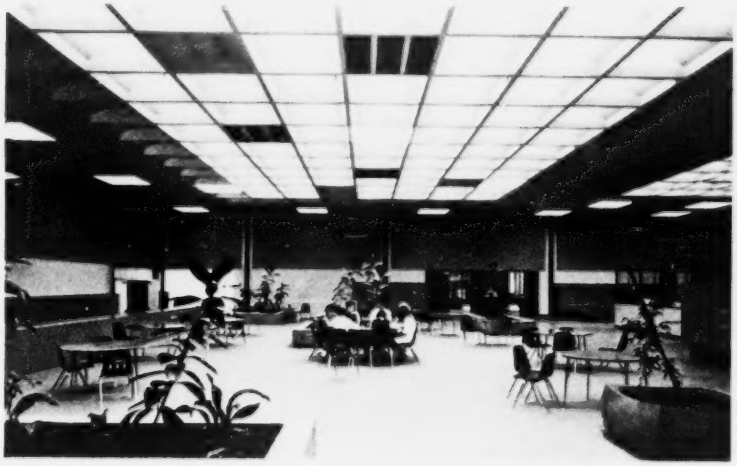
I would like to look out the door and see our nice smoggy sky. It's better than nothing.

. . . build another school with all the ideas that we have written included.

. . . make certain areas of the school soundproof for those who need a place for quiet.

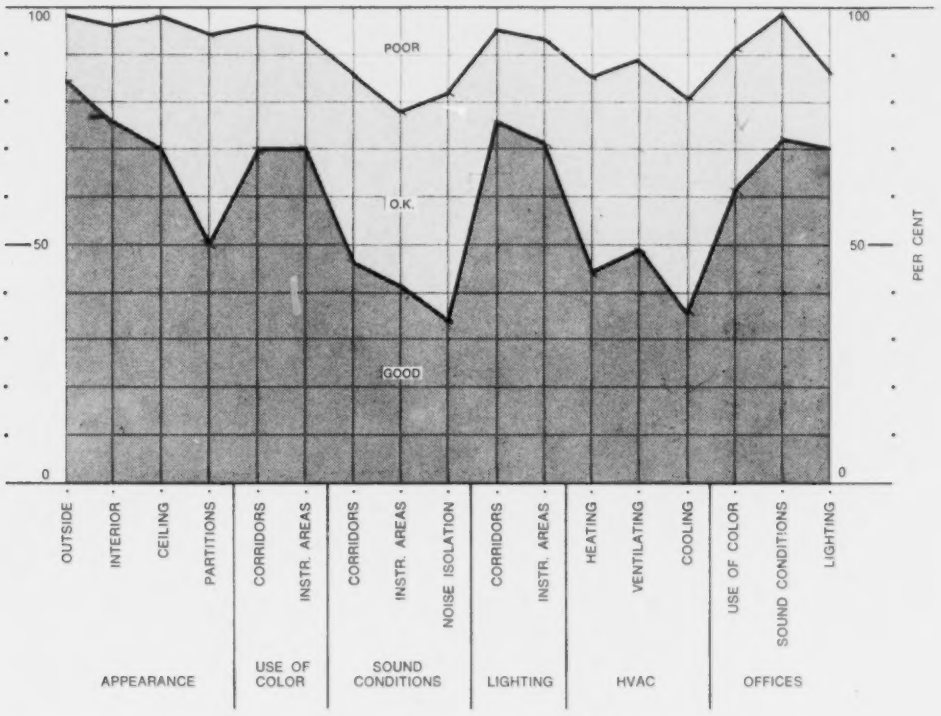
. . . come to the school and stay for a few hours. Go to different classrooms and experiment for themselves instead of asking questions, half of which they won't read.

. . . let the sun shine in.

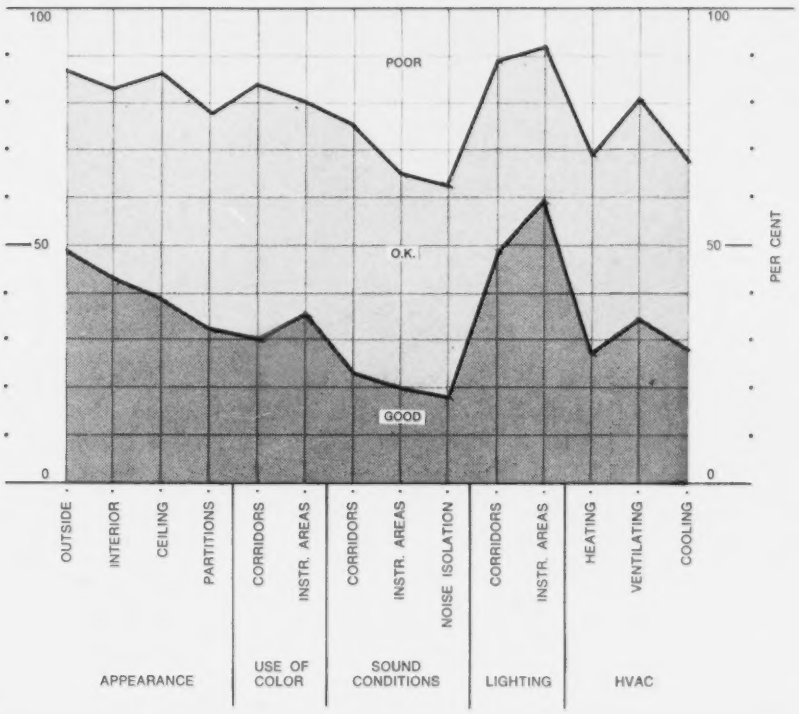


FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	70%	2%	28%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	39%	61%	—
In this school, have you ever requested alterations of spaces which were not approved?	25%	75%	—
Are there alterations which could be made to improve your area?	66%	34%	—



SONORA HIGH SCHOOL FACULTY RESPONSE (N = 51)

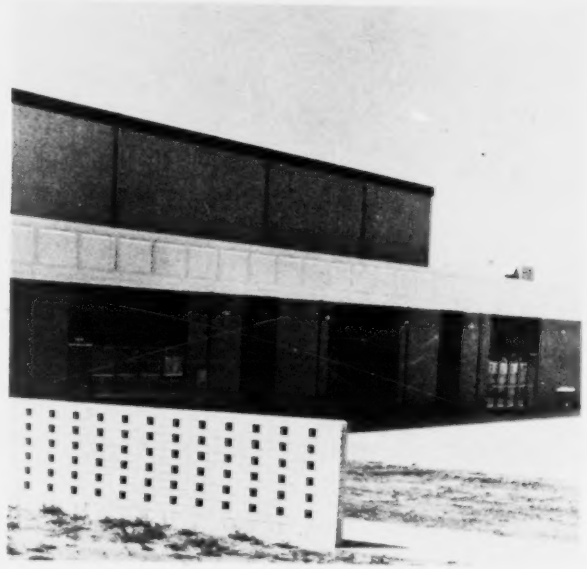


SONORA HIGH SCHOOL STUDENT RESPONSE (N = 241)

ROYAL HIGH SCHOOL

Simi Valley Unified School District
Simi, California

Architect:	Daniel, Mann, Johnson & Mendenhall
Area:	156,488 square feet
Capacity:	1,800 students
Construction Begun:	November 1966
School Opened:	December 1967
Building Cost:	$2,886,525
per square foot:	$18.45
per pupil place:	$1604



STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . add more color to schools. Make the students *want* to come, not *have* to come. Everything is done the same. Each section or each room should be done in different colors to add variety. Same with lockers. Should be different colors to match building.

The rooms need *more windows* and the school needs more restroom facilities.

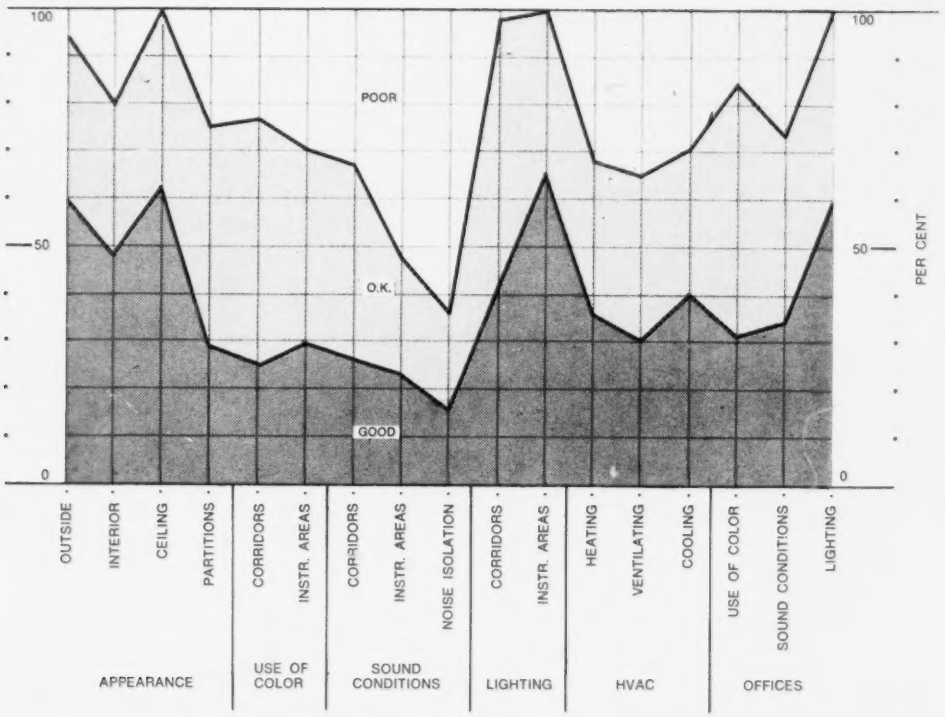
. . . close in the walkways from building to building—or at least put roofing over the walkways. (When it rains, we get soaked.) Also, carpet the classroom. It will make a more comfortable atmosphere to learn in.

. . . ask themselves "would I like to go to this school five days a week, nine months a year, for three years?"

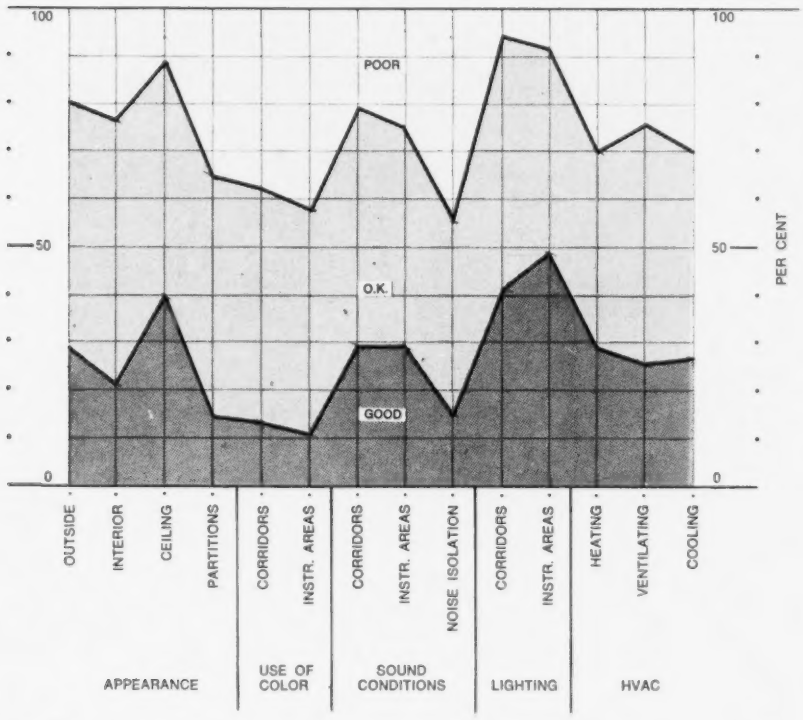
. . . make the place a little more enjoyable by maybe adding a few really nice trees and benches in the grass or something because there is never anywhere to sit except in lunch areas.

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	53%	0%	47%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	10%	90%	—
In this school, have you ever requested alterations of spaces which were not approved?	12%	88%	—
Are there alterations which could be made to improve your area?	65%	35%	—



ROYAL HIGH SCHOOL FACULTY RESPONSE (N = 41)



ROYAL HIGH SCHOOL STUDENT RESPONSE (N = 293)

OAK GROVE HIGH SCHOOL

East Side Union High School District
San Jose, California

Architect:	Allan M. Walter and Associates
Area:	157,707 square feet
Capacity:	1,800 students
Construction Begun:	September 1966
School Opened:	September 1967
Building Cost:	$3,018,000
per square foot:	$19.14
per pupil place:	$1677

STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . use brighter colors of paint for exterior and maybe interior. They are too drab. Also, I wish there were more windows so you could look outside and wouldn't feel hemmed in. Also, I wish they would plant flowers, not just shrubs around the campus.

. . . make rooms with windows. Being enclosed in a small square with no windows is freaky. I don't like four blank walls.

. . . not leave the walkways uncovered. It's hard to walk around when it's raining hard and you don't have your umbrella because you didn't think it would rain. The umbrellas won't fit in your locker. I don't like the walks when they're narrow in the middle. People are knocked down a lot of times. The campus is spread out too much.

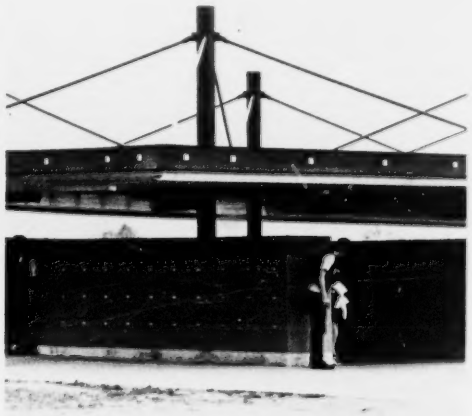
. . . make the schools look like schools instead of prisons.

. . . put a little bit more color into the schools, but this is the most beautiful school around the whole state.

. . . get us a place to eat.

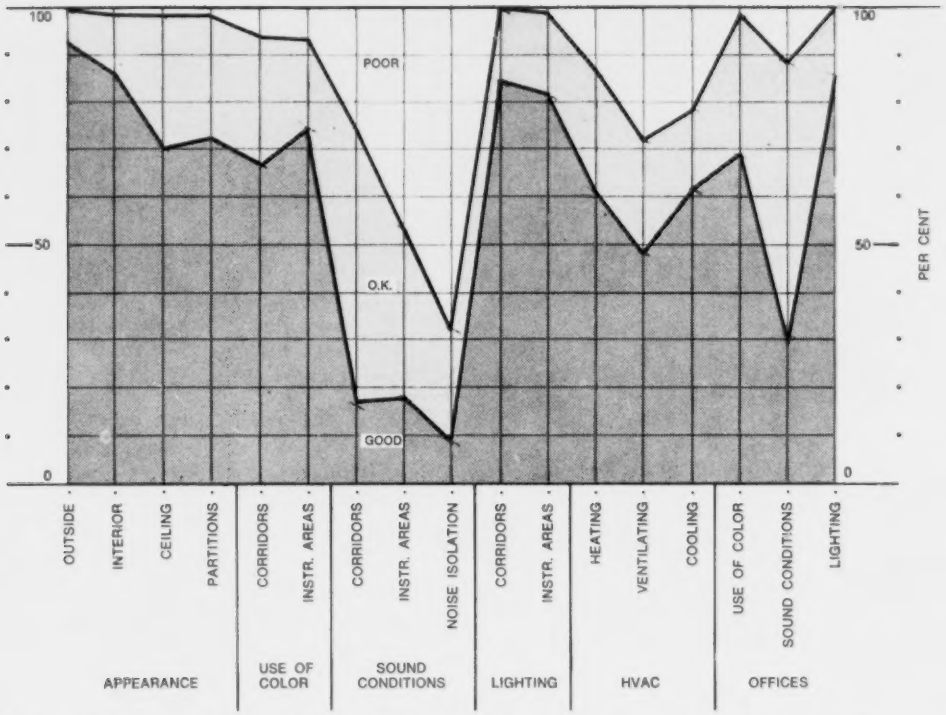
. . . include more shade and landscaping.

. . . have made it easier to put things like pictures and drawings on the walls. The class doesn't look alive without something on the walls.

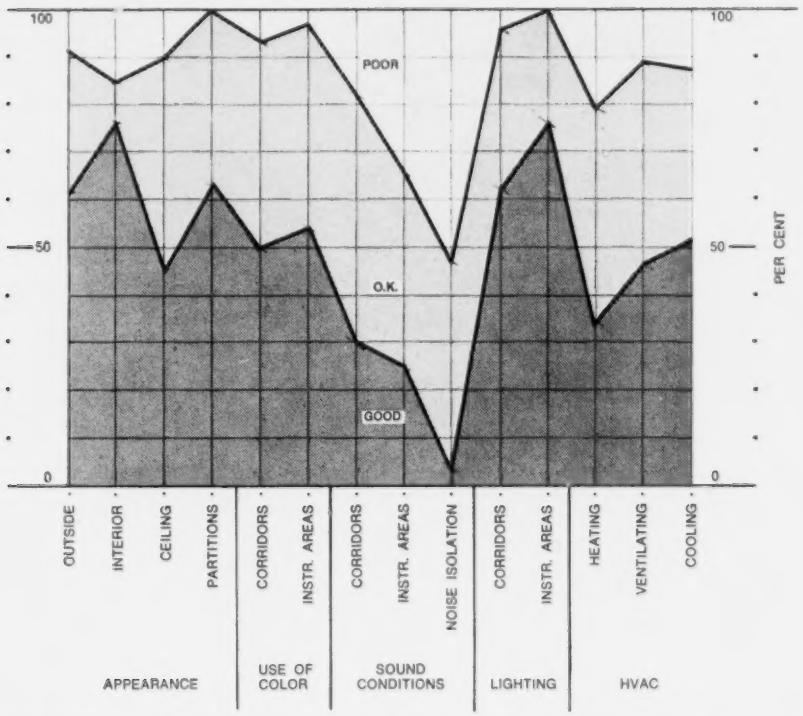


FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	64%	8%	28%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	24%	76%	—
In this school, have you ever requested alterations of spaces which were not approved?	20%	80%	—
Are there alterations which could be made to improve your area?	72%	28%	—



OAK GROVE HIGH SCHOOL FACULTY RESPONSE (N = 37)



OAK GROVE HIGH SCHOOL STUDENT RESPONSE (N = 140)

EL DORADO HIGH SCHOOL

Placentia Unified School District
Placentia, California

Architect:	William E. Blurock and Associates
Area:	94,941 square feet
Capacity:	1,000 students
Construction Begun:	August 1965
School Opened:	September 1966
Building Cost:	$1,750,000
per square foot:	$18.43
per pupil place:	$1750

STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . be more artistic in the way the plants are distributed, and have more foliage throughout the campus.

. . . have put up things to walk under so we don't have to get rained on. Our lockers aren't long enough to keep umbrellas in.

. . . have some kids (high school) on their planning staff. After all we have to spend ten months in their finished product! Cafeteria: we need an inside cafeteria. It's cold and rainy and it's not healthy to eat under those conditions.

. . . use more imagination in colors: a) bright colors for rooms; b) different colors for each building; c) different colored study carrels. Make better chairs. These rip our nylons.

. . . get away from the "ick" colors and be more creative!

The whole place seems too large and impersonal. The neutral colors and diffused lighting are needed, but there needs to be some kind of closer physical relationship—even the furniture—communal tables, for instance. You could also try putting doors on the classrooms and/or having larger windows.

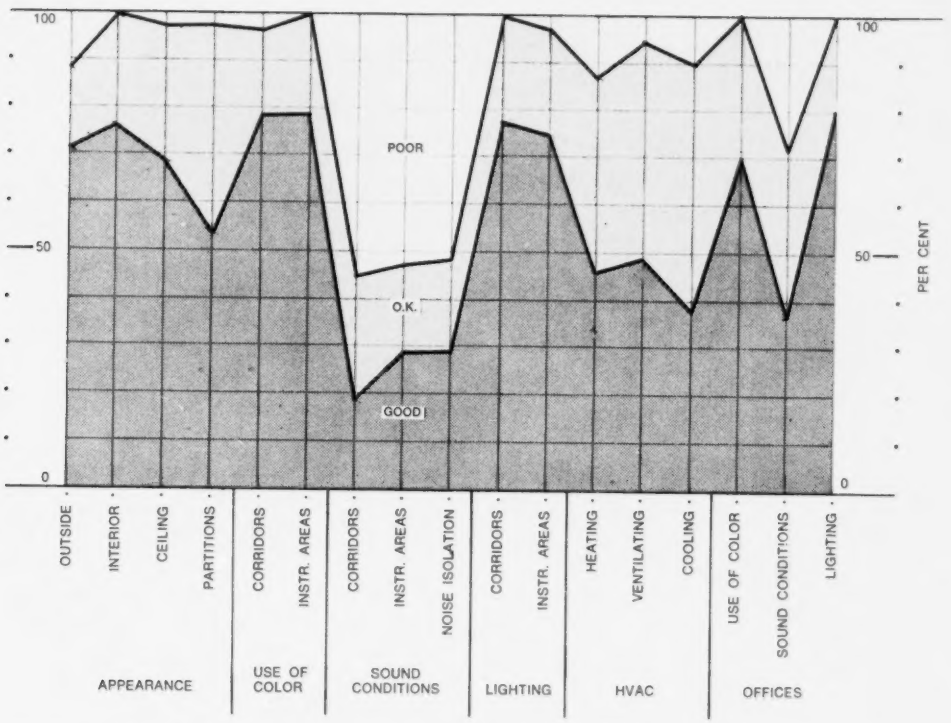
. . . put more places to sit around the school.

. . . put more excitement into the colors as school gets boring and the walls remind me of a type of hospital.

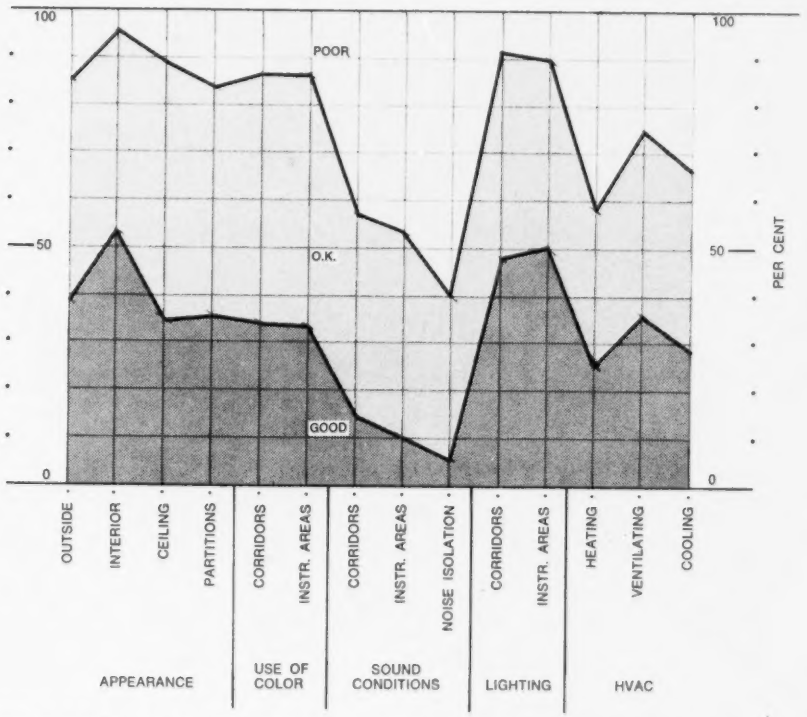
The school was well designed. I think the sound conditions in the instructional areas could have been improved by closing them off more.

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	66%	6%	28%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	21%	79%	—
In this school, have you ever requested alterations of spaces which were not approved?	48%	52%	—
Are there alterations which could be made to improve your area?	91%	9%	—



EL DORADO HIGH SCHOOL FACULTY RESPONSE (N = 34)



EL DORADO HIGH SCHOOL STUDENT RESPONSE (N = 209)

JOHN F. KENNEDY HIGH SCHOOL

Sacramento City Unified School District
Sacramento, California

Architect:	Stafford and Peckinpaugh
Area:	230,732 square feet
Capacity:	2,000 students
Construction Begun:	June 1966
School Opened:	September 1967
Building Cost:	$4,408,214
per square foot:	$19.10
per pupil place:	$2204

STUDENT COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . make escalators or something instead of stairs. When you run up and down stairs to locker, to third floor, to gym, to second floor, to locker, to third floor, it gets kind of tiring and it gets kind of hard on the legs.

. . . make one or two improvements. First, I would like to see that the spots where the corridors meet might be widened just a bit so that there wouldn't be quite so much of a traffic jam.

. . . have put phones in the rooms or at least a P.A. system. I also would have liked carpeting on all floors of the building. The carpeting is fantastic. The most important—carpets make a big difference. They muffle little sounds so you can concentrate better. They really make it quieter, warmer, and more comfortable. I think they should put carpets all over the school. It's great.

. . . put the lockers in the halls located outside the classroom. The lockers also should be full size so books and coats could be put in. During the rainy season the coats and other paraphernalia could thus be placed in the locker with a possible access to books, still. Whereas, the present way books cannot be reached if the locker is jammed with a coat.

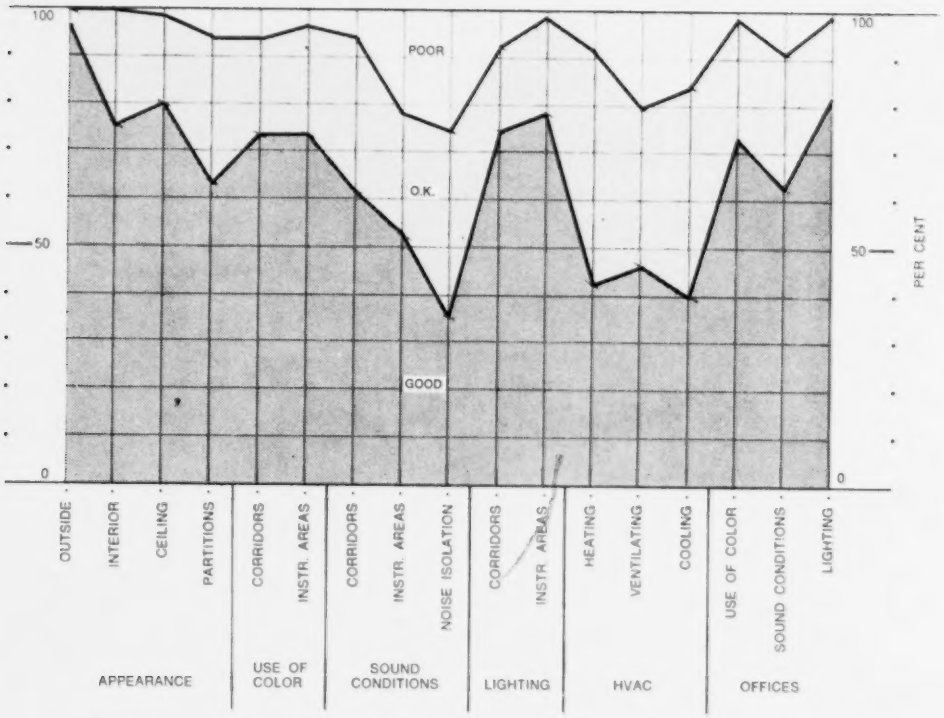
. . . utilize the excellent landscaping by having windows. One half of the time I'm in interior rooms with no outside windows. It is terribly depressing. It is a huge problem. We need an auditorium. When there are windows, they are too small as in the science building. When doors can be opened to the outside it's better. We hardly ever see our colorful grounds.

. . . not be so modern in their design. Sure, it's nice to have a modern school, but I miss windows! It seems to be like a prison sometimes. There is nothing like fresh air from outside! Sometimes the heat won't go off, and we roast! Sometimes it won't come on, and we freeze! Maybe someone will fix it.

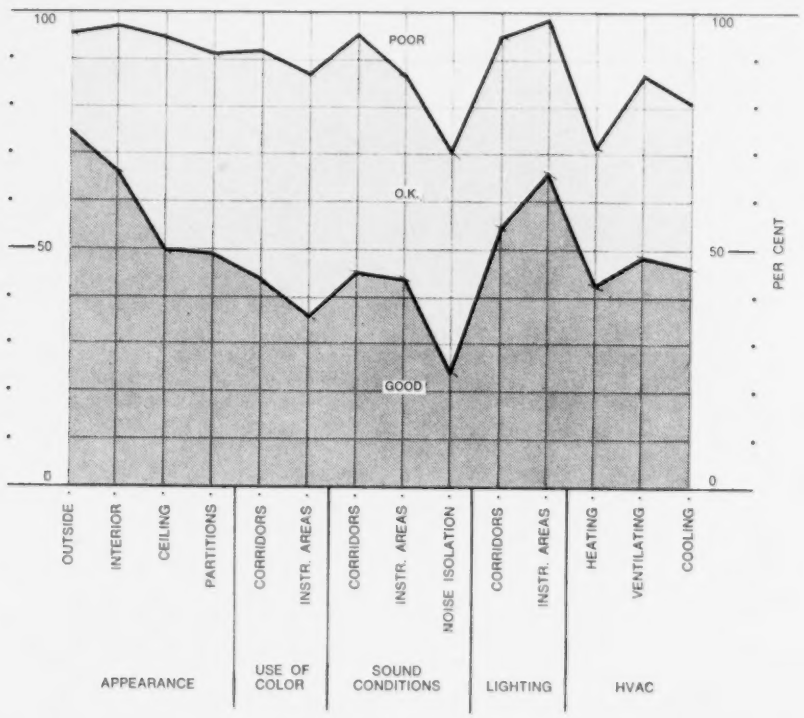
The colors of the rooms are so drab. They should have added more color. All there is, is white, white!

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	31%	2%	67%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	12%	88%	—
In this school, have you ever requested alterations of spaces which were not approved?	6%	94%	—
Are there alterations which could be made to improve your area?	62%	38%	—



JOHN F. KENNEDY HIGH SCHOOL FACULTY RESPONSE (N = 50)



JOHN F. KENNEDY HIGH SCHOOL STUDENT RESPONSE (N = 238)

DE LAVEAGA ELEMENTARY SCHOOL

Santa Cruz Elementary School District
Santa Cruz, California

Architect:	Leefe and Ehrenkrantz
Area:	40,000 square feet
Capacity:	270 students (1st increment)
Construction Begun:	January 1966
School Opened:	October 1966 (1st increment)
Building Cost:	$468,379
Note:	Building cost includes cost of entire structural and enclosure shell, plus first increment of interior systems.

FACULTY COMMENTS

The following are representative of the types of comments written in response to the question: I wish designers of schools would . . .

. . . talk to teachers and custodians first. Make more work rooms and storage areas.

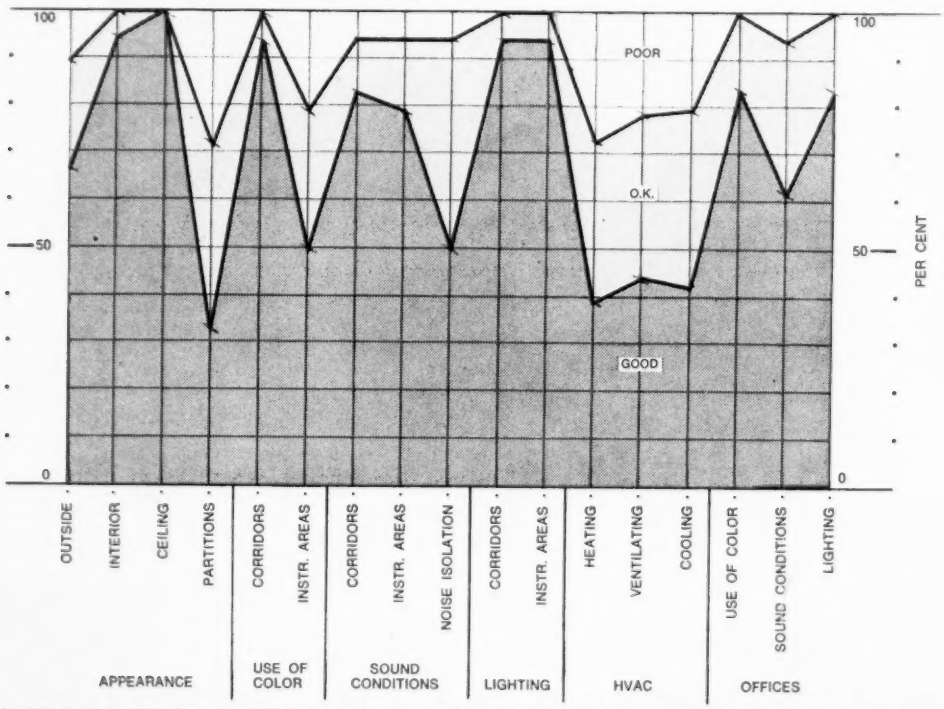
. . . be concerned with teaching and learning problems. This school seems to be well designed in these respects.

. . . eliminate windows that open out onto the sidewalk where children walk and run; glass panels that go to the floor and are easily kicked out; doors and windows that have hinges on the outside which can be easily undone and the school broken into.

Compliments on our school. It is a great place to be!

FACULTY KNOWLEDGE AND USE OF BUILDING FLEXIBILITY

	Yes	*No*	*Don't Know*
Are there formal procedures in this school for requesting alterations of the school building?	13%	27%	60%
In this school, have you made, or been involved in, any alterations of spaces which required physical changes to be made to the school building?	17%	83%	—
In this school, have you ever requested alterations of spaces which were not approved?	6%	94%	—
Are there alterations which could be made to improve your area?	59%	41%	—



DE LAVEAGA ELEMENTARY SCHOOL FACULTY RESPONSE (N = 18)

STUDY NUMBER 2
OAK GROVE HIGH SCHOOL
RESEARCH PROJECT

Background. This study examines the first year of activities of a project of environmental analysis and design being performed in the Science Department of Oak Grove High School, San Jose, California. The purpose of this project is to develop a process by which space users—in this case, science teachers—may design, perform and evaluate experiments in improving the fit of their educational program, activities and environment to the tasks of teaching and learning.

Oak Grove High School is one of the thirteen schools built under the SCSD program. As an SCSD school, Oak Grove possesses the degree of interior flexibility built into that program. Further information and the results of the BSIC 1969-1970 user survey for Oak Grove can be found elsewhere in this publication.

PURPOSE OF THE STUDY

The Science Department. Since the school's opening in 1967, the staff of the Science Department has continually worked with program, materials and teaching spaces to evolve a program of individualized instruction. The absence of teaching materials for such a program has forced them to pace spatial and program development to the rate of materials preparation.

Corresponding to the development of materials and extension of the individual progress mode to additional classes, the departmental suite has undergone a number of changes in spatial configuration, illustrated in Figures 1, 2, and 3. The school opened with a suite of classrooms and teaching laboratories designed to house a program with conventional teacher/student relationships (Figure 1).

The first spatial changes were made in 1968 with the completion of individualized materials for general science and biology programs. At that time, a large study center was created by removing the wall between two classrooms. Three small group spaces were formed with the removed wall panels (Figure 2).

In summer 1970, when the individual program materials were completed for all levels, further spatial changes were made (Figure 3). The storeroom was moved to the former small classroom and provision was made for use of this space in preparing experiments. The wall between the study center and the former storeroom was removed, creating a 3600 square foot Science Resource Center, or SRC, which was recarpeted.

While implementing these changes, the staff had often experimented with the spatial configuration of the suite, in terms of furniture layout, equipment location, and circulation, seeking better forms to fit their program.

The Department Program. Before proceeding to a discussion of methodology, it will be useful to examine the program of the department. Under the individual progress form, each year of science study is divided into a series of "packets," each packet providing materials and assignments designed to give the student a basic understanding of a topic or concept of science. The students go through each year's packet sequence at their own rate.

The school day was divided at the time of the study into six periods with an average length of fifty-five minutes each. During the typical period, 177 students, five teachers, and three teacher aides occupied the SRC and the accessible labs. Typical disposition of these occupants was 20 students and one teacher in each lab, one aide and one student in the materials preparation area, and the remaining 130 plus students, three teachers, and two aides in the SRC.

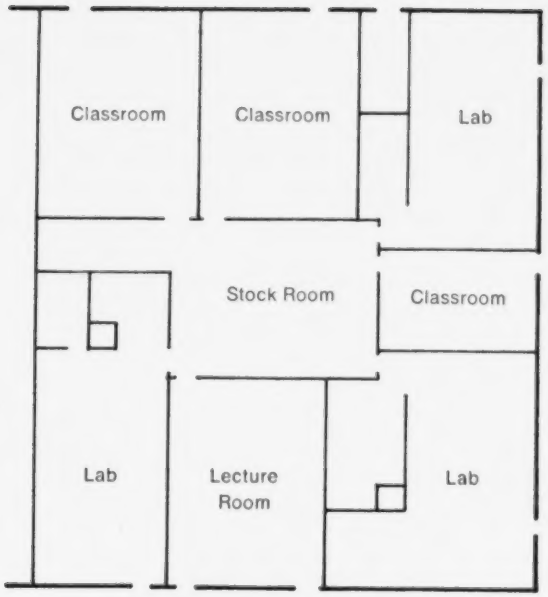


FIGURE 1

Opening Day Plan of Science Department Suite

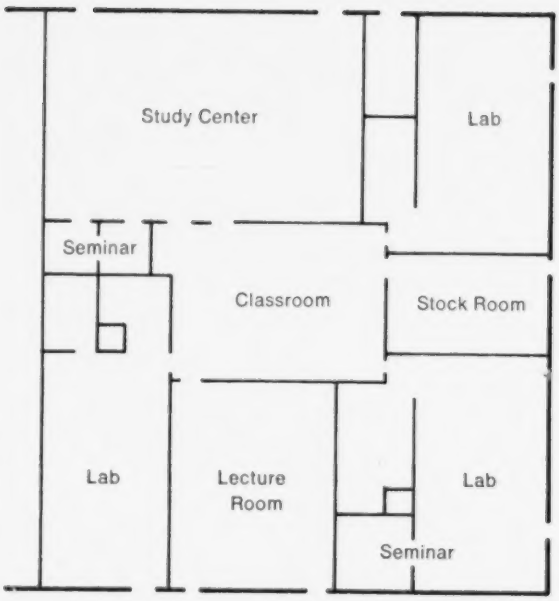


FIGURE 2

Department Suite after First Set of Spatial Alterations

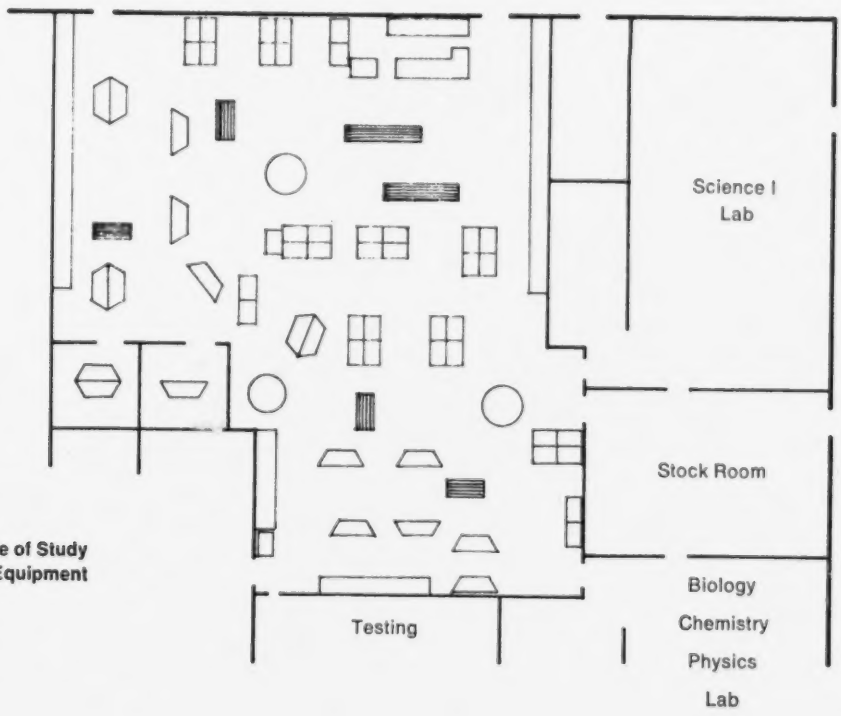


FIGURE 3

Department Suite at Time of Study Showing Furniture and Equipment Layout

Measurement of the Systems Performance.

To test these objectives, a month-long series of studies were made in the department suite in February and March 1971. These studies were concentrated in three main areas: environmental, behavioral, and attitudinal conditions.

Environmental Measurement Studies. Three aspects of environmental conditions were measured—thermal environment, lighting, and noise levels. The measurement of existing lumination levels was performed by BSIC/EFL staff on March 4, 1971 using an illumination meter placed desk high at intersections of the planning grid, within study carrels, and at other significant locations.

At three locations within the SRC, a Lennox Industries, Inc., representative placed automatic temperature recording devices, one of which was equipped with a relative humidity recorder, to continuously monitor conditions on March 2, 1971. A fourth temperature recording device was placed in the rooftop multizone package serving the department.

The level of noise within the principal spaces of the suite—the SRC and the two accessible labs—was measured by Bolt, Beranek, and Newman, Inc., Acoustic Engineers, on March 2, 1971. Continuous measurements of the noise levels at two locations in the SRC, and at regular intervals in the two labs, were made for the entire class day. In addition, spot measurements of sound conditions in other spaces in the school were made at random intervals on March 23, 1971.

Behavioral Studies. During a two-week period, a group of graduate students in education from Stanford University and San Jose State College made a series of mapping and observation studies of behavior in the department. Emphasis in this program was on observing and recording grouping patterns and the types of activities engaged in by groups and individuals in the SRC and the two accessible labs.

Using an observation format consisting of a coding system for seven activity categories and a mapping strategy developed from the statements of department objectives, the observer corps completed over 2000 activity maps during the two-week period of the study.

Survey of Student Attitudes. An "opinionaire" survey of student attitudes toward aspects of the program and the environment in the school and the Science Department was prepared and administered. For purposes of comparison, the opinionaire was also administered at two other high schools in the district.

Synthesis of Results of Observations.

After the results of the various observation and measurement studies had been analyzed by the consultants who performed them, they were presented to the entire study group for further analysis and synthesis. This synthesis process took the form of a series of work sessions with the goal of replanning the department and the activities of the teachers to better serve their objectives.

One of the principal tools of the replanning process was a model of the SRC upon which were placed scale models of the furnishings and equipment available for and necessary to its operations. Work sessions were held in the SRC so immediate identification between models and "real" furnishings were possible.

After considerable discussion of results and formulation of conclusions in the form of planning criteria (see the next section), the staff was encouraged to manipulate the model to create new spatial designs. Consultants discussed the implications of various layouts with the staff as these designs emerged. At intervals, the model was photographed with a Polaroid camera to provide a permanent and readily available record of planning evolution. When a solution satisfactory to the staff was developed, it was implemented by school custodial personnel.

PRESENTATION OF THE DATA

Although a great deal more data was collected, the selection presented in this section contains much of the information which was of significance in the planning of modifications in department spatial and environmental conditions, and in the activities of teachers.

Environmental Data.

Noise Levels. The results of the measurement of noise levels in the SRC during a class day is presented in Figure 5. This chart presents a full day's data as if for a "typical" fifty-five minute class. Actual decibel values recorded varied $\pm$ 5 db from the line on the chart. Figure 6 compares these noise levels with those of the two labs and of other spaces in the school. The results of the acoustic studies indicate that the noise levels in the SRC and the two labs are similar and, in both cases, of a level sufficient to be considered a major problem.

Hygrothermal and Visual Environments. Thermal environment and lighting conditions were found to be inadequate due to a failure to change the configurations of lighting fixtures and ceiling air diffusers when the spatial changes were made.

The lighting system was found to be potentially capable of providing effective illumination levels throughout the SRC, but the existing configuration was ineffective for the pattern of space use. For example, one of the areas of over-100 footcandle illumination was being used for book storage while a similar amount of space with 8 to 30 footcandle levels was being used as a student work area.

W[illegible]e in the department spaces during a class period, the students are largely free to choose their own activity and grouping patterns. The students are assigned to a teacher who takes attendance and serves as primary resource for his classes, but the teacher does not often lecture or instruct the class as a group.

The Need for the Study. Up to the fall of 1970, major spatial changes in the department suite had been made in response to rather obvious pressures of program change. With the completion of the educational materials for all levels, these direct pressures disappeared. The department staff, however, was not fully satisfied with the fit of the program, materials, spaces and environment, and contacted BSIC/EFL for assistance in developing methodology and in gathering data upon which further changes, "experiments," could be based and evaluated.

A work group was put together consisting of representatives of BSIC/EFL, the Stanford University School Planning Laboratory, the Eastside Union High School District, of which Oak Grove is a part, and the school itself. This group first met in October 1970 and began the development of project methods and procedures. Other groups which have contributed their time and services to this program include the First California Commission on School Construction Systems, the Education Department at San Jose State College (now California State University, San Jose), the Stanford Center for Research and Development in Teaching, and Lennox Industries, Inc.

Development of Project Methodology. The study team decided to maintain the "experimental" nature of the staff's approach to spatial and environmental changes. In order to respond to the general project objectives, however, this approach would be supplemented by methodology and observation procedures.

The basic procedures of the methodology developed for the program are:

1. Statement of the objective of the experiment by the teaching staff and conversion of this statement into a set of measurable behavioral objectives.
2. Behavior is observed.
3. Initial analysis of this data is performed by the evaluation team and presented to the teaching staff.
4. The team and staff together synthesize these results into conclusions about the experiment, or redesign criteria for program, spaces, or both.
5. The action suggested by this synthesis is taken.

This methodology is illustrated as a process in Figure 4, a form known as "cyclical empirical evaluation."

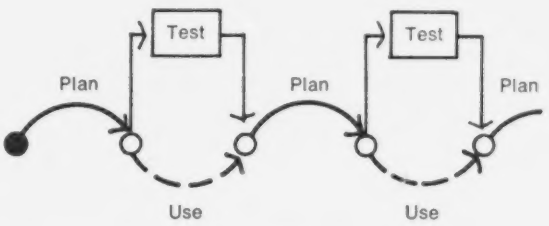


FIGURE 4

Empirical Evaluation Process

STUDY PROCEDURE

In order to provide comparisons for future experiments, the first step was to form a data base on existing environmental, behavioral, and attitudinal conditions. This data base was initially formed by treating the existing educational program as an implemented experiment and applying the methodology to it. To place this phase of the study in context, these activities cover one cycle of the process illustrated in Figure 4, beginning with a "use/test" half cycle and ending in a "plan" and implement phase.

Staff Objective Statements.

Accordingly, the staff stated the objectives of the existing program in a concise form to be evaluated against actual system behavior. The resulting goal statements can be paraphrased as follows:

1. Educational objectives
   a. To provide for a variety of student learning styles.
   b. To permit the student to choose his learning style and his own rate of progress.
   c. To make use of this student self-determination in fostering student self-motivation.
2. Environmental objectives
   a. To create an environment which encourages reasonably quiet study.
   b. To provide a variety of spatial and work conditions which allow the student to select conditions to meet his current needs.
   c. To provide an environment that is pleasant, convenient and flexible in arrangement to meet changing long- and short-term needs.
   d. To provide spatial and work conditions which encourage a good teacher/student relationship.

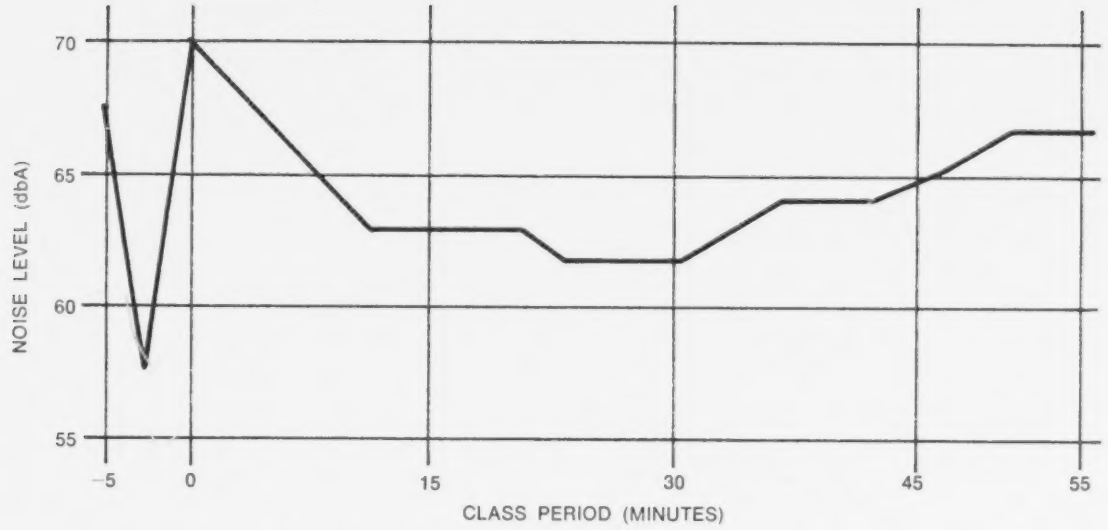


FIGURE 5

Noise Level in Resource Center During Typical Class Period

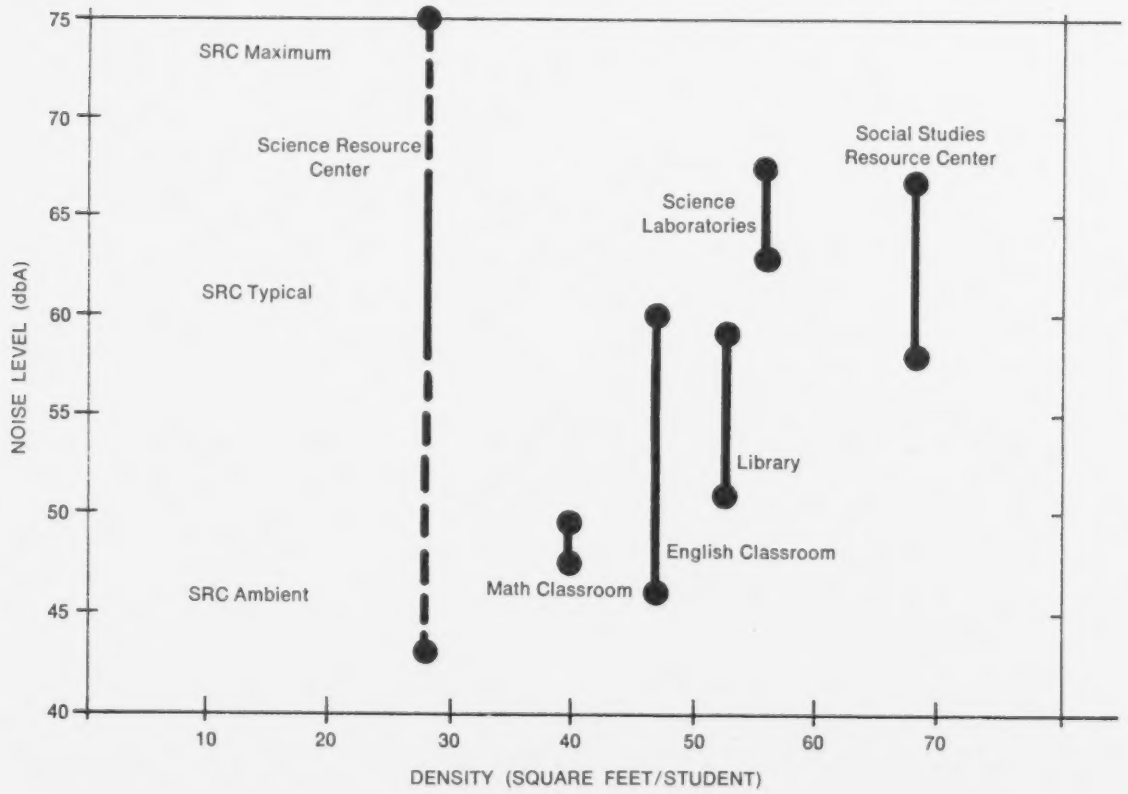


FIGURE 6

Noise Levels and Densities in Various Spaces

TABLE I

PERCENTAGE OF STUDENTS ENGAGED IN VARIOUS ACTIVITIES DURING CLASS PERIOD

	Science Resource Center				*Two Laboratories*			
	Third of Period			*Net*	*Third of Period*			*Net*
Activity	*1st*	*2nd*	*3rd*	*Change**	*1st*	*2nd*	*3rd*	*Change**
Science Tasks	57.0%	54.6%	43.2%	−13.8%	75.3%	68.9%	72.3%	−3.0%
Social Interaction	26.0	29.6	38.5	+12.5	7.2	14.3	13.6	+6.4
Teacher Interaction	4.0	3.7	2.8	− 1.2	4.9	6.9	2.8	−2.1
Idle	5.1	4.4	6.9	+ 1.8	6.0	5.0	5.0	−1.0
Other Subjects	3.3	3.4	3.9	+ 0.6	1.4	1.4	1.5	+0.1
Movement	4.6	4.3	3.9	− 0.7	5.2	3.6	5.6	+0.4

* Net Change = (Percentage in final third) − (Percentage in first third).

The air-conditioning system, while maintaining temperature within designed limits, had inadequate air movement patterns in the former storage area, and the treated air had a very low relative humidity.

Behavior and Activities.

Table I presents the results of the mapping of the activity categories during the two-week study period. In this analysis, two of the seven categories—individual and group science related activities—have been combined into the "Science Tasks" category. Additionally, the class period has been divided into thirds to indicate the change in proportions of students engaged in various activities as time passes.

A study of this table indicates that there is a much higher incidence of relevant (science-oriented) activity in the two labs and that all major activities in the labs are more stable over time. A combination of factors—greater direction of task, more teacher supervision, preference among male students for manual tasks, and others—apparently influence this distinction.

The relationship of group size and activity engagement is shown in Table II. Two tendencies of larger, i.e. three or more persons, groups were noted—in the SRC larger groups tended to be working on non-relevant activities and, over time, larger groups tended to become less relevantly oriented. Although the program objectives imply an *individual* progress philosophy, the majority of students worked in groups rather than alone. A summary of Table II shows that in the SRC 53 per cent of the students worked in groups and in the labs, 54 per cent.

TABLE II

PERCENTAGE OF STUDENTS ENGAGED IN VARIOUS ACTIVITY AND GROUPING PATTERNS IN THE SCIENCE RESOURCE CENTER AND THE TWO LABORATORIES

	Activity Type					
	Science Related		*Social*		*Other*	
Group Size	*SRC*	*Labs*	*SRC*	*Labs*	*SRC*	*Labs*
Individuals	34%	34%	—	—	13%	12%
Groups of Two	10	22	12	6	—	—
Groups of Three or More	12	20	19	5	—	—

Student Attitudes and Perceptions.

The results of the attitude survey indicated that student interest in science was about the same as their interest in most subjects at the school. Nearly two-thirds of the students reported general satisfaction with the department program, while a much larger percentage, 80.9 per cent, preferred the open space plan to conventional classrooms.

Noise and Distraction. Table III compares the percentage of students reporting distraction due to various factors in the department. When comparing the figures for distraction due to noise in the SRC and the two labs, it should be borne in mind that acoustic studies indicate quite similar sound conditions in all three spaces.

TABLE III

PERCENTAGE OF STUDENTS INDICATING DISTRACTION DUE TO SEVERAL FACTORS

Distraction Factor	*Resource Center*	*Labs*
General noise level	48.3%	23.4%
Presence of other students	36.4	24.1
Movement of other students	23.5	17.7
Conversation of other students working on science	24.2	16.2
Social conversation of other students	55.9	37.7

The students were also queried about distraction due to noise and activity in other similarly used spaces in the school. More students reported distraction due to noise and activity in the SRC (57.6 per cent) than in the two labs (22.7 per cent), the Social Studies Resource Center (17.6 per cent) or the Library (17.5 per cent). Figure 6 compares noise levels and student densities (area available per student) in each of these spaces.

From these results it appears that distraction is not only related to noise and activity in general, but also to the type of noise or activity causing the distraction, the type of activity in which the respondent is engaged, and the density of students in the space.

Relations with Teachers. Although most students reported that they could work most of the time with little or no supervision, about one-half of the students reported that they had difficulty in obtaining teacher assistance when they needed or wanted it. On the other hand, over half (51.8 per cent) felt that they could work effectively with the teachers when necessary.

SUMMARY AND CONCLUSIONS

As a result of the comparison of the observed results with the curriculum and environmental objectives of the department program, some conclusions in the form of criteria for activity, spatial, and environmental redesign were developed. The key elements in this redesign program were:

1. Environmental conditions in the suite had to be improved, including:
   a. Better room sound conditions brought about by better sound absorption of wall and ceiling surfaces *and* increased control of noise generative activities *and* reducing relative student density;
   b. Reconfiguration of the lighting into a pattern which provides a more even distribution;
   c. Reconfiguration of air diffusers to provide better room air movement patterns;
   d. Increasing spatial variety through the use of space dividers and furnishings.
2. Better use had to be made of existing spatial and environmental conditions, especially if items in (1) above could not be implemented in order to:
   a. Improve the use pattern for existing lighting;
   b. Reduce the relative density of students, including the use of surrogate spacing devices such as space dividers;
   c. Improve traffic circulation in the SRC, including relocation of key SRC functions, such as materials center and storage.
3. The teachers had to take a more active part in the activities of the SRC and the labs to:
   a. Control noise generation;
   b. Direct activities into more useful channels;
   c. Control group formation and size;
   d. Improve the teacher/student relationship;
   e. Take a more active role in activities and learning in the SRC;
   f. Form groups of various sizes for the purposes of special study, group projects, and group identification.
4. The program would have to provide for a greater variety of activities and learning styles. The choices available in learning style were almost exclusively in rate of progress through fixed patterns, the packets allowing little, if any, variety in learning style.

Implementation, Some Problems. As a result of drastically increased enrollment in the school in the fall of 1971, the redesign recommendations which required district level financial assistance to implement—acoustic treatment, room dividers, new furnishings, major system reconfigurations—had to be postponed indefinitely. Implementations involving teacher activities and reconfiguration of furnishings and equipment were immediately executed.

In the spring of 1971, the feasible recommended changes were implemented and the department operations continued in the modified environment. Although no measurements were made, the teachers were satisfied that conditions were improved, possibly because of increased teacher activity and better spacing of students.

During the summer of 1972, steel panels in the ceiling system are being replaced with acoustic tile panels as recommended by the study group and the acoustic consultant.

A Beneficial Consequence. In discussions with department staff since the study was begun, it appears that perhaps the most beneficial result has been an increase in the teachers' understanding of what goes on in the department. One outcome of this increased understanding is greater teacher confidence in guiding and controlling group formation and other student activities. A second result is an improved ability to communicate their goals and objectives in behavioral and environmental terms which can be measured, often by as simple a process as looking to see if something is happening.

STUDENT QUESTIONNAIRE USED IN SCSD EVALUATION

The aim of the designers of school buildings is to provide the users -- teachers and students -- with facilities that will be functional and pleasant places in which to work. In order to further this objective, designers need to know how you, the user, feel about the facility in which you work. Please give us your frank opinions on the following items by checking the appropriate spaces. For example:

if you feel that there is inadequate parking space, you might find a question and answer it in this manner

	GOOD	OK	POOR	COULD BE IMPROVED BY
1. The parking lot is:			X	adding more spaces

If you would like to comment on any of the questions, or have comments on areas not covered in this questionnaire, please feel free to do so on the back of the sheet.

THIS IS MY FIRST YEAR ( ) THIRD YEAR ( )
SECOND YEAR ( ) FOURTH YEAR ( ) IN THIS SCHOOL.

	GOOD	OK	POOR	COULD BE IMPROVED BY:
1. Overall appearance of school is:				
2. Outside appearance of school is:				
3. Interior appearance of school is:				
4. Colors in instructional areas are:				
5. Colors in corridors are:				
6. Sound conditions in instructional areas are:				
7. Sound conditions in corridors are:				
8. Noise isolation between rooms is:				
9. Chalkboard is:				
10. Appearance of interior walls is:				
11. Artificial lighting in instructional areas is:				
12. Artificial lighting in corridors is:				
13. Appearance of ceiling is:				
14. Ventilation is:				
15. Heating is:				
16. Cooling is:				
17. Book lockers are:				
18. Colors of book lockers are:				
19. Finish of book lockers is:				

20. Please answer this question on the back of the sheet: "I wish designers of schools would ___"

FACULTY QUESTIONNAIRE USED IN SCSD EVALUATION

NAME _____

DEPARTMENT, OR SUBJECT TAUGHT _____

THIS IS MY FIRST YEAR ( ) THIRD YEAR ( )
SECOND YEAR ( ) FOURTH YEAR ( ) IN THIS SCHOOL.

The aim of the designers of school buildings is to provide the user with facilities that will be functional and pleasant places in which to work. In order to further this objective, designers need to know how you, the user, feel about the facility in which you work. Please give us your frank opinions on the following items by checking the appropriate spaces.

If you would like to comment on any of the questions, or have comments on areas not covered in this questionnaire, please feel free to do so on the back of the sheet.

1. Is it possible to alter or change the location of the following?

	YES	NO	DON'T KNOW
Interior walls	_____	_____	_____
Accordion partitions	_____	_____	_____
Operable panel partitions	_____	_____	_____
Lighting fixtures	_____	_____	_____
Ceiling panels	_____	_____	_____
Heating/air conditioning outlets	_____	_____	_____
Cabinets	_____	_____	_____
Interiors of cabinets	_____	_____	_____

2. Are there formal procedures in this school for requesting alterations of the school building? _____ _____ _____

If YES, describe these procedures _____

_____

_____

	YES	NO
3. In this school have you made or been involved in any alteration(s) of spaces which required physical changes to be made to the school building?	_____	_____
4. In this school have you ever requested alteration(s) of spaces which has not been approved?	_____	_____

5. Are there any alterations which could be made to improve your area? YES ____ NO ____

If YES, describe these changes _____

_____

_____

	YES	NO	DON'T KNOW
6. Do you like full-length chalkboard?	____	____	____
7. Is there a thermostat in your room?	____	____	____

If NO, go to question 9.

8. How often do you change the setting of the thermostat?

MORE OFTEN THAN DAILY ( ) DAILY ( ) SOMETIMES ( )

NEVER ( ) CHANGE IS NOT PERMITTED ( )

Answer Questions 9 through 13 about this school in general.

	GOOD	OK	POOR	DOES NOT APPLY	WHAT IS THE PROBLEM?
9. General appearance of school - exterior:					
a. Overall appearance is:					
b. Outside appearance is:					
10. General appearance of school - interior:					
a. Interior appearance is:					
b. Colors in instructional areas are:					
c. Colors in corridors are:					
d. Colors in offices are:					
11. Acoustics:					
a. Sound conditions in corridors are:					
b. Sound conditions in offices are:					

	GOOD	OK	POOR	DOES NOT APPLY	WHAT IS THE PROBLEM:
12. Lighting:					
a. Artificial lighting in corridors is:					
b. Artificial lighting in offices is:					
13. Student lockers:					
a. Student lockers are:					
b. Colors of student lockers are:					
c. Finish of student lockers is:					

Answer Questions 14 through 20 about the room in which you spend most of your daily time. Give room number _____.

	GOOD	OK	POOR	DOES NOT APPLY	WHAT IS THE PROBLEM:
14. Sound conditions are:					
15. Interior walls:					
a. Noise isolation between room is:					
b. Chalkboard is:					
c. Provision for attachment of materials to walls is:					
d. Appearance of interior walls is:					

	GOOD	OK	POOR	DOES NOT APPLY	WHAT IS THE PROBLEM?
16. Accordion partitions:					
a. Noise isolation between rooms is:					
b. Ease of operation is:					
17. Moveable panel partitions:					
a. Noise isolation between rooms is:					
b. Ease of operation is:					
c. Chalkboard finish is:					
18. Lighting and ceiling:					
a. Artificial lighting in this room is:					
b. Appearance of ceiling is:					
19. Heating and air conditioning:					
a. Ventilation is:					
b. Heating is:					
c. Cooling is:					
d. Thermostatic control is:					

	GOOD	OK	POOR	DOES NOT APPLY	WHAT IS THE PROBLEM?
20. Cabinetry:					
a. Cabinets are:					
b. Colors of cabinets are:					
c. Finish of cabinets is:					

21. I wish designers of schools would _____

_____

_____